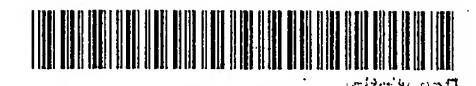
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### **EUROPEAN PATENT APPLICATION**

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(71) Applicant: JFE Steel Corporation aliane Tokyo, 100-0011 (JP) or example Japaneae Examined Patent Application Public

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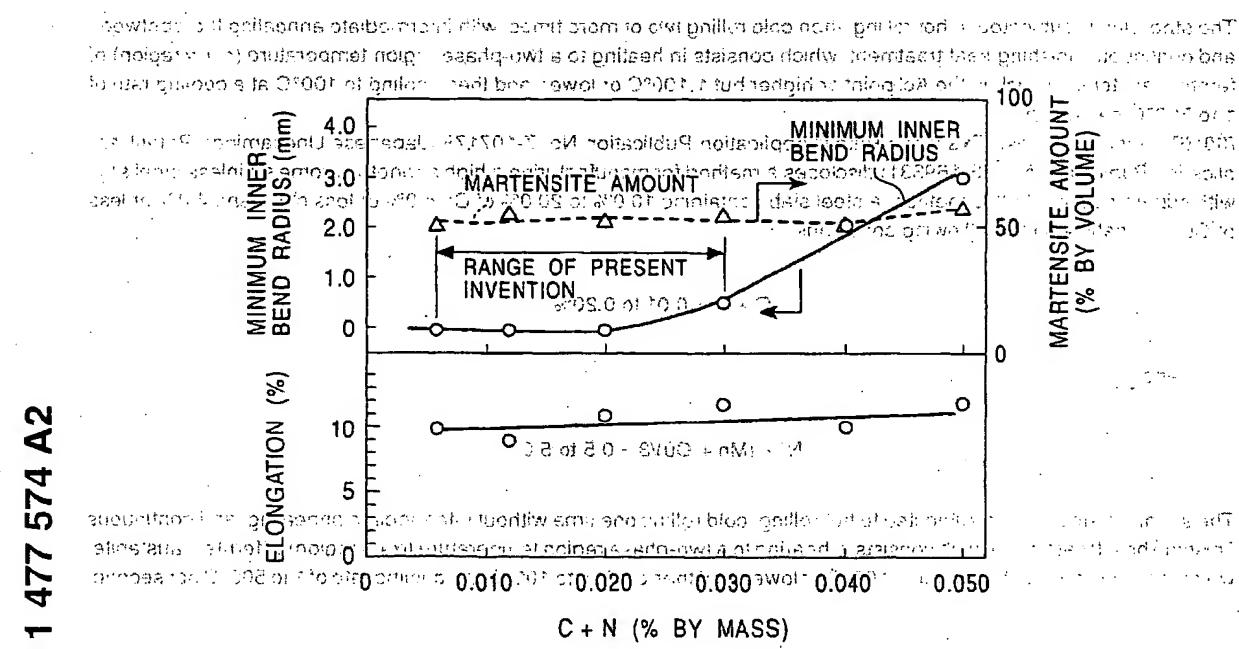
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(54) High-strength-stainless-steel sheet and method for manufacturing the same a product sheet and method for manufacturing the same a product sheet and method for manufacturing the same a product sheet and method for manufacturing the same appropriate sheet and method for m method a prefered containing 10 0% to 14 0% of Ch 3 0% or less of Mill and 3 0% or less of Cull and satisfying the

Material for stainless steel sheets is heated to a temperature within a range of 850 to 1250°C and cooled at a rate 1°C/s or faster, the material including 0.02% by mass or less of C, 1.0% by mass or less of Si, 2.0% by mass or less of Mn, 0.04% by mass or less of

P, 0.01% by mass or less of S, 0.1% by mass or less of Al, 11% by mass or more but less than 17% by mass of Cr, 0.5% by mass or more but, less than 3.0% by mass of Ni, and 0.02% by mass or less of N, so as to satisfy specific relationships between the compositions.

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#### BACKGROUND OF THE INVENTION

#### Field of Invention

[0001] The present invention relates to a high-strength stainless steel sheet, and particularly relates to a high-strength stainless steel sheet for civil engineering and construction structural materials.

SUPPLIENT APPLIENT APPLIED STATE

#### Description of Related Art

(22) Pate of Gend 05.05,260 ( [0002] Conventionally, as high-strength stainless steel sheets for structural materials of which corrosion resistance is required, cold-rolled austenitic stainless steel sheets, or martensitic stainless steel sheets, which have been tempered (84) Decignated Contracting States and annealed, have been widely used.

[0003] However, austenitic stainless steel sheets have a low Young's modulus, which is disadvantageous when it comes to ensuring rigidity in structural design. Also, austenitic stainless steel sheets may exhibit structural defects because of the strains introduced during cold rolling, and further, the costs of manufacturing austenitic stainless steel sheets are high because approximately 8% by mass of Ni, which is expensive, is used. Moreover, martensitic stainless steel sheets exhibit poor ductility, and markedly deteriorated workability.

[0004] On the other hand, ferritic stainless steel sheets have good ductility, but exhibit a low strength. Attempts have been made to improve the strength of ferritic stainless steel sheets by cold-rolling to increase strength, but this method reduces ductility because of the introduction of rolling strain, and there have been cases of fracturing at the time of forming.

An attempt has been made to deal with these problems by using a mixed structure of ferrite and martensite, thereby establishing both high strength and high ductility. For example, Japanese Examined Patent Application Publication No. 7-100822 (Japanese Unexamined Patent-Application Publication No. 63-169334) discloses a method for manufacturing a high-ductility and high strength chrome stainless stele strip with small in plane anisotropy. In this method, a steel slab containing 10.0% to 14.0% of Cr, 3.0% or less of Ni, and 3.0% or less of Cu, and satisfying the following conditions: Land reserved applied in (5.1) I fracence or stabiliess step shoets is heated to

A. Tak balangar et eller til kalandar.

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and

The steel slab is subjected to hot rolling, then cold rolling two or more times, with intermediate annealing therebetween and continuous finishing heat treatment, which consists in heating to a two-phase region temperature ( $\alpha + \gamma$  region) of ferrite + austenite, which is the Acl point or higher but 1,100°C or lower, and then cooling to 100°C at a cooling rate of 1 to 500°C per second.

[0006] Also, Japanese Examined Patent Application Publication No. 7-107178 (Japanese Unexamined Patent Application Publication No. 63-169331) discloses a method for manufacturing a high strength chrome stainless steel strip with superb ductility. In this method, a steel slab containing 10.0% to 20.0% of Cr, 4.0% or less of Ni, and 4.0% or less of Cu, and satisfying the following conditions:

and

Ni + (Mn + Cu)/3 = 0.5 to 5.0 
$$^{\circ}$$

The stainless steel strip is subjected to hot rolling, cold rolling one time without intermediate annealing, and continuous finishing heat treatment, which consists in heating to a two-phase region temperature ( $\alpha + \gamma$  region) of ferrite + austenite, which is the Acl point or higher but 1,100%C or lower, and then cooling to 100°C at a cooling rate of 1 to 500°C per second.

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[0007] Further, Japanese Examined Patent Application Publication No. 8-14004 (Japanese Unexamined Patent Application Publication No. 1-172524) discloses a method for manufacturing a high-strength chrome stainless steel strip with superb ductility. In this method, a steel slab containing 10.0% to 20.0% of Cr, 4.0% or less of Ni, and 4.0% or less of Cu and more than 1.0% but 2.5% or less of Mo, and satisfying the following conditions:

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great Academyly in the relation of the present invertible of the above described problems, and provide a their arcrigit elabestic of short with extallest betterg would live and weld zone toughness for dividending and constitudion structural materials which require corresponding and age. The high-stratight addissedies, basic office to this invention is also absigned for vehicle-reinfing. I year structure meterials such as offare beams, etc. sulfably employed for bicycles, automotive valuales, railway various, and a property required on assigned An object of security and representation is about a provided a following to the provided as follow (6015) It is enother object of the present invention to ordinate high-arrength standess steel a real with surcein The stainless steel strip is subjected to hot rolling, cold rolling and continuous finishing heat treatment, which consists in heating to a two-phase region-temperature (α + γ region) of ferrite + austenite; which is the Aclipoint or higher but 1,100°C or lower, and then cooling to 100°C at a cooling rate of 1 to 500°C persecond. அவர்கள் எர்கள் நார [0008]39fAlso, conventionally, ferritic stainless steel plates such as SUS430, SUS430LX, etc., having 16 to 18% of Cr thave been used for steel sheets for bicycle rims, primarily because of their good corrosion resistance. Recently the trend is for reduced weight in bicycles hand there is a demand for reduction in the thickness of bicycle rims, so there is a need to further improve the strength of SUS430, SUS430 LX; retc. (450 to 550 MPa). Normally, bicycle rims are manufactured by bending a steel sheet, overlapping the widthwise center and the widthwise ends and seam welding. then cutting to a predetermined length; forming a ring shape and performing flash butt welding at the abutted cut ends as shown in a cross-sectional diagram (Fig. 5A) taken along line VB-VB. Accordingly, strength, toughness; and corro-[0017] To achieve these objects indicate this ashed of the pagnot blewight tabbariuparanatailear noise [0009]: Whilight of such problems, a high-strength Cr-containing stainless steel used for bicycle wheel rims is proposed in, for example, Japanese Examined Patent Application Publication No. 7-51737 (Japanese Unexamined Patent Application Publication No 1-55363), wherein the chemical composition is adjusted to 11% to 17% of Cr. 0:8 to 3.0% of Ni, and 0.05 to 0.35% of Nb. 0.05 to 0.8% of Cu, and satisfying the following conditions: visites of as the section

C + N < 0.05%

Nb/(C + N) ≅ 2.5 to 7 40 €

and

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a CRE value of 5 to 20.

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[0010] This composition exhibits little material deterioration even after welding two or more times, and exhibits a proof stress of 60 kgf/mm<sup>2</sup> (588 MPa) or more in application to bicycle wheel rims.

[0011] However, while the steel sheets (steel strips) described in Japanese Examined Patent Application Publication No. 7-100822 (Japanese Unexamined Patent Application Publication No. 63-169334), Japanese Examined Patent Application Publication No.57-107178 (Japanese: Unexamined Patent Application Publication No.163-169331) sand Japanese Examined Patent Application Publication No. 8-14004 (Japanese Unexamined Patent Application Publication No. 1-55363) exhibit sufficient workability in ductility and press forming, a problem remains in that sufficient bending iproperties are not obtained, which is an important feature in working structural materials. Moreover, the toughness of Mo and 0.1% or more by mass but less than 2:0% by mass of Ct. Also the composition in light rearring gritished with the properties of the composition of the composit [0012] Also, while the steel sheets (steel strips) described in Japanese Examined Patent Application Publication No. ්7්51737 (Japanese Examined Patent Application Publication No? 1455363) Japanese Examined Patent Application Publication No.7-100822 (Japanese Unexamined Patent Application Publication No.63-169334) (Japanese Unexamined Patent Application Publication No. 7-107178 (Japanese Unexamined Patent Application Publication No. 63-169331), and Japanese Examined Patent Application Publication No. 8-14004 (Japanese Unexamined Patent Application Publication No. 8-14004) lication No. 1-55363) each achieve a high enough strength to contribute to the reduction in the weight of bicycles. The process of manufacturing bicycle rims includes the essential process of punching holes for spokes through the seam weld zones as shown in Fig. 5A-5C, and rims manufactured using the steel sheets (steel strips) manufactured with the techniques described in these four documents generally exhibit cracking at the seam welding zones at the time of punching the spoke holes. Thus, the techniques described in these documents present problems regarding punching workability of the weld zones.

[0013] On the other hand, cold-rolling austenite stainless steels, such as SUS304, to increase strength of bicycle

rims might be conceived, but it should be noted that austenite stainless steels have a low. Young's modulus, is very disadvantageous regarding rim rigidity, and manufacturing costs; are high, due to the use of 8%-by, mass or more, of montres estes enterente un contentre expensive Nitrial of the page to an order of the property of the all become and the The part of mages of Man and stage of Sport that is a complete the

#### SUMMARY OF THE INVENTION

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[0014] Accordingly, it is an object of the present invention to solve the above-described problems, and provide a high-strength stainless steel sheet, with excellent bending workability and weld zone toughness, for civil engineering and construction structural materials which require corrosion resistance. The high-strength stainless steel, according to this invention, is also designed for vehicle-reinforcing weld structure materials such as pillars, beams, etc., suitably employed for bicycles, automotive vehicles, railway vehicles, and so forth, which require corrosion resistance. An object of the present invention is also to provided a method for manufacturing the stainless steel sheet.

[0015] It is another object of the present invention to provide a high-strength stainless steel sheet with superior corrosion resistance and workability regarding punching of welded zones, which would be, for instance suitably employed for vehicular use; such as/for bicycle wheel rims and so forth, for example, and also to provided a method for manufacturing the stainless steel sheet. Depos in the protection of a 2000 to the decimal term to the content of the content o [0016] Stitishould be noted that with regard to the present invention, the term shigh-strength stainless, steels heet refers to stainless steel sheets with tensile strength of about 730 to 1200-MPacTensile strength of 730 MPacexceeds the strength of conventional SUS/430 and SUS/430LX, and accordingly is sufficiently strong to allow for the reduction of the thickness of bicycle rims. Also, tensile strength exceeding 1200 MPa provides higher strength as a structure, but also provides an increase of the spring-back force, making bending at the time of forming the rim extremely difficult. A stainless steel sheet for bicycle rims preferably exhibits a tensile strength of about 800 MPa; and more preferably us shown in a cross-sectional diagram (Fig. SA) taken about the VR VR Accordingly strength tougs PM:000 (cot(00,0) [0017] To achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve these objects, according to a first aspect of the present invention; achieve the present invention is a first aspect of the present invention; achieve the present invention is a first aspect of the present invention in the present invention is a first aspect of the present invention in the present invention is a first aspect of the present invention in the p sheet-comprises::a composition including 0.02% by mass or less of @71:0% by mass or less of Sip2:0% by mass or less of Mn, 0.04% by mass ordess of P; 0.01% by mass or less of Sy 0.1 % by mass or less of Al, 14.% or more by mass but less than 17% by mass of Gr; 0:5% or more by mass but less than 3.0% by mass of Ni, and 0.02% by mass or less of N, so as to satisfy the following equations (1) through (4), යට ම ණම ගණමර ගම්ම කම්ම ම මා මුල් ව ලෙස යේ.

> 12≤Cr+Mo+1.5 Si≤17 (1)

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e-comblew and to vinigs are.

1≤Ni+30(C+N)+0.5(Mn+Cu)≤4 (2)

 $Cr + 0.5 (Ni + Cu) + 3.3 Mo \ge 16.0$ a CRE value of 5 th 2.

10910] This composition exhibits little material determention over after welding two or more times, and exhibits a Scot sings of 60 kgf/mm<sup>2</sup> (588 MPa) of more in application to hand which first (588 MPa) of more in application (60.0 \(\frac{1}{2}\) HOwever while the steel sheets (steel strop) down to it is used see Exemined Patent Application (60.7 f). No. 7 100822 regornesh Unexamined Patent Application Publication No. 68-169334), Jebaneso Examined Patent wherein, the contents of C; N; Si, Mn; Cr, Mo, Ni and Cu are in % by mass, and the remainder of the alloy essentially consists of Fe and a structure including 12 to 95% by volume of martensite; and the remainder essentially consisting uon No. 1-65363) exhibit sufficient workabilibi in ductiling and termina is problem remains in that sufficient ethnicians ethnicans ethnicians ethnicians ethnicians ethnicians [0018] fo The composition may further comprise one or both of 0:1% for more by mass but less than 2.0% by mass of Mo, and 0.1 % or more by mass but less than 2.0% by mass of Cu. Also, the composition may further comprise 0:00005% 10012] Aiso while the steer sheets (steet strips) described in Janacose Examinad Patent (B., locasam yd %0000):0.01 [0019] agMoreover, the composition may further comprise 0.5% or more by mass but less than 2.0% by mass of Mo and 0:0005% to 0:0050% by mass of B, with the range of C, Al,; Cr, land N, being further restricted to 0:020%; by mass or less of C, 0.10% by mass or less of Al, 11.0% or more by mass but less than 15.0% by mass of Cr., and 0:020% by mass or less of N, and with equations (1) through (4) being replaced by the following equations (5) through (8), or a lication (ye. 1-55363) each achieve a high anough strungth to committee to the reduction in the weight of biovities. The wrocess of manufacturing bicycle rims includes the essent of purishing holes for spokes through the seam (5). 1.2 is 3.1 + 0M + 10 ≥ 0.41 when the seal shown in Fig. 5A 5C and rims manufactures using the seal shows in Fig. 5A 5C and rims manufactures using the seal shows is shown in Fig. 5A 5C and rims manufactures using the seal shows is shown in Fig. 5A 5C. tecknones described in these four documents generally extitles tracking at the seam werting zoner at the time of 2.0≤Ni+30 (C + N) + 0.5 (Mn + Cu) ≤ 3.0 (6) charantic or in light smeldord from the

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colcing râte et till, or faster and wherein the composition or or material standars steet should be ussigned for (₹). (₹) - Cr + O.51 ≤ oM 8.8 + iN 5.0 + Cr + O.50 centers and bundhing workning with the composition composition. 10026] Administration of the english of the content of the content of the earth of the primary of Cur [ODDFT] According to various exemplary embodigious, for each in stainless store sheet tray on for an material shishalashvi haa to ijan aran na haran anasa saka sakaya'an anayaid iat usku sa ol 5 103267 Advording to venous exemplant concodiments from the serious may be a hot-rolled stablished, and the stee wherein, the contents of C, N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass, and wherein the structure includes: 20% by volume or more of martensite, and the remainder essentially consisting of ferrite. Accordingly, the composition and the structure of the high-strength stainless steel sheet is designed for excellent corrosion resistance and punching workability of weld zones. 3.6 10 . [0020] According to various exemplary embodiments; the composition may contain less than 0:04% by mass of Cu. [0021] According to various exemplary embodiments; the high-strength stainless steel sheet may be four im material to be used for bicycles runicycles poarts using spoke wheels tricycles pand wheelchairs analoxe de al 3 pin [1800] [0022] According to various exemplary embodiments, the steel sheet may be a hot-rolled steel sheet; and the steel sheetimay/beratook/diagram schemetically distrative, nurror wished lesistations advantaging and excitation of the contraction o [0023] According to a second aspect of the present invention, with a manufacturing method for a high-strength stainless steel sheet) the material for stainless steel sheets is subjected to finishing heat treatment by being heated to a temperature within the range of 850 to 1250°C, and then cooled at a cooling rate of 1°C/s or faster, the composition of the material includes: 0.02% by mass or less of C, 1.0% by mass or less of Si, 2.0% by mass or less of Min 10.04% by mass or less of P, 0.01% by mass or less of S, 0.1% by mass or less of Al, 11 % or more by mass but less than া 7% by mass of Ory 0:5% or more by mass but less than 3:0% by mass of Ni and 0:02% by mass or less of Ni so as of high-strength sizinless steet sheets, have been studied and (4); thought(1) sheets steet sheets have been studied and the continuence of high-strength sizinless steet sheets. cording to various exerciplary empodiments [D035] (1) Restricting the chronic equivalent (2) - No. Ellipse the model equivalent (NF - 30 (C + NF - 0.5 (MH pexim etrirei + etianemera a otri ebem yilcee e 12≤Cr+Mo+1.5 Si≤17 ewoila agner beminierobard a midiiw or (uC) + structure, and that right tonsile strength of 730 MPF or within the obtained without loosing ductility (2) Bending workshifty markedly improves by adjusting frequencial Cland N included so that the (C + N) [88991 1≤Ni+30(C+N)+0.5(Mn+Cu)≤4 (2) anount is within an appropriate range. (3) Weld zone toughness is markedly improved or section the amount of Cland Nichhlauned and also in-100371 30 gluding Ni. Cr + 0.5 (Ni + Cu) + 0.6 (Ni + amount, with regard to a stoel sheet 10,003 to 0,025% of C. Gutte of S. 0,2% of Mn. 0,02% of P. 0,003% of S. 0,003% state (ix + y-region) at 1000 to 1100°C, so as to yield a letter in the child structure 35 **7£** wherein; thercontentsrof/CaNaSij/Mni, CraMo; Ni and Culare in %by massu betset any yilide/how probned [0000] a[0024]∜ The:composition/may further include one or both of 0:1%:or more by∉mass;but less than∈2:0%:by∉mass of Moyand 0.1 %cor more by maṣṣ̄ but less than 2:0% by mass of @uṣAlso; the composition may further include 0.0005% amount of (C + M) exceeds 0.05%, bending workability many-deteriorates, though it B to assmiyd %0000;0 total [0025]: Woreover, the composition may further include 0.5% or more by mass but less than 2:0% by mass of Morand √0.0005%/to=0.0050%/by.masstof B,.with:the range of C, Al, Cr, and N; being:further/restricted to:0.020%/by mass for ∹lessrof Cନ0ા10%by≀mass orgesskof:Al,ધ1ા.0‰or more by≀mass but≀less≀than⊾15։0‰by⊧mass⊧öfkCr, and:0։020‰by mass or less of N, and with the equations (1) through (4) being replaced by the following equations (5) through:(8),73 10041] (4) Restricting the chromium equivalent (Cr. - Moritists) and the nickel equivalent (Ni - 30 (Cr. N) - 0 E Mr. + Cur to within an even narrower rance their describes about in fit, and also including appropriate amounts of ockin ethne) + etisnehamis otni ebam ylisae ed ci i i i compositi i i o be markediy improves quenchically and a non ebam ylisae ed ci i i i compositi e i compositi e i entre markediy improves quenchically and a non ebam ylisae ed ci i i i compositi e i compositi e i entre markediy improves quenchically entre entre e i entre structure, and that high tensile strength of 800 MPa or higher care to obtained without loosing ductifity [0043] (E) Setting the amount of Chiconterned to requirement of the properties and adjusting the amount of Chandin contained so that (C + N) is within an appropriate rance even bear than described above in (3) markedly improves (7). We punching worksbillty of the weld zones [0044] First the reason for restricting the composition of the high sherith stainless steel sheet according to various exemple or income the present invention will be described. Should be noted that in the following "% by mass: \$2.0 \general \text{20.00} \general \text{20.00} \general \text{20.00} \general \general \text{20.00} \general \general \text{20.00} \general \gen specifically stated (thenvise wherein, the contents of C, N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass, wherein the material is subjected to a finishing heat treatment by being heated to a temperature within the range of 900 to 1200°C, and then cooled at a

cooling rate of 5°C/s or faster, and wherein the composition of the high-strength stainless steel sheet is designed for excellent corrosion resistance and punching workability of weld zones.

[0026] According to various exemplary embodiments, the composition may contain less than 0.04% by mass of Cu. [0027] According to various exemplary embodiments, the high-strength stainless steel sheet may be for rim material to be used for bicycles, unicycles, carts using spoke wheels, tricycles, and wheelchairs.

[0028] According to various exemplary embodiments, the steel sheet may be a hot-rolled steel sheet, and the steel sheet.may be a cold-rolled steelrsheets. Assume to the life of the steel sheet and the steel sheet are a steel sheet and the steel sheet are a steel sheet and the steel sheet are a steel sheet and the sheet are a steel sheet and the sheet are a steel sheet and the sheet are a sheet a sheet a sheet are a sheet a

[0029] Per Fig. 2 is a photograph of the structure of a steel plate (Nov2-1) taken with an optical microscope; [1200] [0031] Fig. 3 is an explanatory-diagram-schematically illustrating a notch position of a weld-heat-affected zone toughness-test: piecepha meta policino is advantable or a seed and a meta such as a seed plate (Nov2-1) taken with an optical microscope; [1200] [0031] Fig. 3 is an explanatory-diagram-schematically illustrating a notch position of a weld-heat-affected zone toughness-test: piecepha meta policino is advantable or a seed to the property of the

[0035] (1) Restricting the chrome equivalent (Cr + Mo + 1.5Si) and the nickel equivalent (Ni + 30 (C + N) + 0.5 (Mn + Cu) to within a predetermined range allows the composition to be easily made into a martensite + ferrite mixed structure, and that high tensile strength of 730 MPa or higher can be obtained without loosing ductility.

[0036] (2) Bending workability markedly improves by adjusting the amount of C and N included so that the (C + N) amount is within an appropriate range.

[0037] (3) Weld zone toughness is markedly improved by reducing the amount of C and N contained and also including Ni.

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[0038] Fig. 1 illustrates the relationship between (C + N) amount and bending workability, elongation, and martensite amount, with regard to a steel sheet (0.003 to 0.025% of C, 0.2% of Si, 0.2% of Mn, 0.02% of P, 0.003% of S, 0.003% of Al, 13% of Cr, 0.5% to 2.5% of Ni, and 0.003% to 0.025% of Ni, wherein the amounts of C, Ni, and Ni are adjusted such that the volume percentage of martensite is approximately 50%) air-cooled from a ferrite + austenite two-phase state ( $\alpha + \gamma$  region) at 1000 to 1100°C, so as to yield a ferrite + martensite structure.

[0039] Bending workability was tested using a cold-rolled steel sheet 1:.0 mm in thickness, which was bent 180% and the minimum radius r'(mm) where breaking did not occur was obtained Also, a tensile test was performed on the same steel sheet to measure elongation; thereby evaluating ductility. As can be seen on Figure, from the point whereathe amount of (C + N) exceeds 0.03%, bending workability markedly deteriorates, though there is hardly any change observed in ductility. Thus, it can be understood from Fig. 1 that the (CarlN) amount greatly affects bending workability. [0040] a vither effects of various elements and structures on the corrosion resistance and weld zone punching workability have also been studied; and, as a result of this study, the following was found, according to various exemplary embodiments your the same privated and well as a result of this study.

[0041] (4) Restricting the chromium equivalent (Cr + Mo + 1.5Si) and the nickel equivalent (Ni + 30 (C + N) + 0.5 (Mn + Cu) to within an even narrower range than described above in (1), and also including appropriate amounts of Mo and B, markedly improves quenching and allows the composition to be easily made into a martensite + ferrite mixed structure, and that high tensile strength of 800 MPa or higher can be obtained without loosing ductility.

[0042] (5) Adjusting the amount of Cr, Ni, and Mo contained so that {Cr+ 0.5 Ni + 3.3 Mo} reaches a predetermined value or greater markedly improves corrosion resistance of the parent material and punch hole shearing face.

[0043] (6) Setting the amount of Cr contained to less than 15% by mass and adjusting the amount of C and N contained so that (C + N) is within an appropriate range even narrower than described above in (3) markedly improves the punching workability of the weld zones.

[0044] First, the reason for restricting the composition of the high-strength stainless steel sheet, according to various exemplary embodiments of the present invention will be described. It should be noted that in the following, "% by mass" will be expressed simply by "%", i.e., that all percentages in the following are to be understood to be % by mass unless specifically stated otherwise.

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(10045] According to Various exemplarly embodiments, carbon (C) is an element which increases the strength of the desired strength! However, including more steel; and is preferably included at 0.005% or more in order to ensure the desired strength! However, including more than 0.020% markedly decreases ductility; bending workability, and weld zone toughness; and particularly deteriorates bending workability and punching workability of weld zones. Accordingly, carbon is restricted 0.02% or less; with the present invention. It should be noted that carbon should be 0.02% or less, or more preferably 0.015% or less; from the perspective of bending workability and punching workability of weld zones. Even more preferable is 0.010% or less. 10046] Also, for applications where correspond fees and punching workability of weld zones. For more preferable, and carbon should be 0.020% or less, or more preferably 0.015% or less, or more preferably 0.015% or less, or more preferably 0.015% or less, or more preferable is 0.010% or less, or more preferable of bending workability and punching workability of weld zones. Even more preferable is 0.010% or less, or more preferable of bending workability and punching workability of weld zones. Even more preferable is 0.010% or less, and resolved the carbon and reverse to a standard contract of the standard punching workability and punching workability of weld zones.

Silicon: 1.0% or less

Mickel 0.5% or more but less than 5.0%.

[0047] According to various exemplary embodiments, silicon (Si) is an element which acts as an deoxidant, and also improves the strength of the steel. These effects are markedly recognized by including 0:05% Silo more. However, including more than 1.0% Si hardens the steel sheets and reduces toughness. Accordingly, silicon has to be restricted to 1.0% of less. More preferable is 0.3% or less, for increasing toughness; and to and the path anaptad of schan region (et a jiregio in landinum arely 650 to 1750°C. For tigili strendini ondini 617 or more mokeli is profunding indiaded ip this end On the other hand including 3 Chilological artise, increases hardness, easifro %0.2 easing manageringly, in the present invention, nickel is lesinated to 0.5% or more but less than 3.0%. More preferable is a range of = [0048] According to various exemplary embodiments manganese (Mn) is the element which generates austenite, and with the present invention, 0.1 % or more is preferably included to generate 12 to 95% by volume of austerite at the time of the finishing heat treatment, at the ferrite + austenite two-phase temperature region ( $\alpha$  + y region) (approximately 850 to 1250°C). However, including more than 2.0% Mn reduces the ductility and corrosion resistance of the steel sheet. Accordingly, manganese has to be restricted to 2.0% or less, and more preferably to 0.5% or less for aductility and corrosion resistance enteres as a two records come yealquexe sucres of publicable (3500) and it is with at their but at large amount or nitroger included the kediy deteriorates duchity wold zone toughness end bending worksolity. Perticularly uncluding more than 0.02% are developed assistant sections with and and and and an end and more than 0.020% mark divideteriorates puncturing viorkability of the weld zonos. Accordingly in the present in-

[0049] La According to various exemplary embodiments phosphorous (P) is an element which reduces the ductility of the steel sheet, and is largely reduced in various exemplary embodiments of the present inventions however, large reduction of P requires a long time for dephosphorousing at the time of manufacturing the steel, which raises manufacturing the steel, which raises manufacturing to steel, which raises manufacturing the steel, which raises manufacturing the steel, which raises manufacturing to steel which raises manufacturing the steel, which raises manufacturing to steel in the present invention is 0.04% For path and the steel ductility, 0.03% or other present in a steel of steel and the steel and t

• Sulfur: 0.010% or less.
TOUSS: It evanous exemplary embediesents or the but sent or execute to the above-described basic com

[0050] According to various exemplary embodiments, sulfur (S) is an element which exists in the steel as an inclusion and generally reduces the corrosion resistance of the steel, and is preferably reduced as much as possible in the present invention. However, excessive reduction of S requires along time for desulfurizing at the time of manufacturing the steel, which raises manufacturing costs. Accordingly, the upper limit for sulfur in the present invention is 0.01 %.

For better corrosion resistance, 0.005% for less is preferable, sinamely and organized a summer of summer and model [9800] and a senor blev to seet general along name of a construction of summer and an entire of section and entire or bloods the needed dented and and a construction and and an entire or section and bloods the needed dented and an entire or section and an entire or section and bloods the needed dented and an entire or section and an entire or bloods the needed dented and an entire or section.

[0051] According to various exemplary embodiments, aluminum (Al) is an element which acts as a deoxidant and 0.01% or more is preferably included, but including more than 0.1% results in a significant generation of including hore than 0.1% results in a significant generation of including hore than 0.1% results in a significant generation of included, but including more than 0.1% results in a significant generation of included including the including the including the included of including the included of including the included of including the included of the included

[0052] Also, for applications where corrosion resistance and puriching workability of weld zones are required, such as usage for wheels like bicycle rims or the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and even more preferably 0.05% or less well-dones are sometimed and section of an included and standard and section of an included and standard and standard and section of a continuity of weld zones are required, such as usage for wheels like bicycle rims or the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and 20% or and section of the like bicycle rims or the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and 20% or an included and standard or an included and standard and section of the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and 20% or an included and standard and section of the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and 20% or less, and an included and standard and section of the like, aluminum should be 0.1% or less, more preferably is 0.10% or less, and 10% or less, and 10%

[0053] According to various exemplary embodiments, chromium (Cr) is an element which effectively improves corrosion resistance, which is a feature of stainless steel, and 11% or more; preferably 11.0% or more of Cr need to be included to obtain sufficient corrosion resistance. On the other hand, excessive chromium may deteriorate the ductility

and toughness of the steel sheet, so including 17% or more Cr markedly deteriorates the bending workability. Accordingly, in the present invention, chromium is restricted to 11% or more but less than 17%. Also, 15.0% or more chromium markedly deteriorates the punching workability of the weld zones, so less than 15.0% is preferable. Also, for better corrosion, resistance, chromium included is preferably 12% or more, more preferably 13% or more, and for better punching workability of the weld zones, is preferably less than 14.0%. Moreover, for better bending workability, less than 15% is preferable, and more preferably less than 14% and punching workability of weld zones are required; such as use in wheels like bicycle rims or the like; chromium should be equal to or more than 11.0% but less than 15.0%. For better corrosion resistance, chromium included should be 12% or more, more preferably 13% or more, and for better punching workability of weld zones, less than 14.0%. Moreover, for better bending workability, less than 15% is preferable, and less than 14% is more preferable.

Silver 100 on ens

Nickel: 0.5% or more but less than 3.0%

[U047] According to various execuplary embodiment's silicon(S) and element which acts as an decripant, and also [0055] - According to various exemplary embodiments; nickel (Ni) is an element which improves the corresion-resistance and toughness of weld zones, and generates austenite, in the present invention, 12 to 95% by volume of austenite needs to be generated at the time of the finishing heat treatment, with the ferrite + austenite; two-phase temperature region ( $\alpha + \gamma$  region) (approximately 850 to 1250°C), for high strength, and 0.5% or more nickel is preferably included to this end. On the other hand, including 3.0% or moremarkedly increases hardness, and ductility decreases. Accordingly, in the present invention, nickel is restricted to 0.5% or more but less than 3.0%. More preferable is a range of 1.8% or more but 2.5% or less. Nickel of 2.5% or less will yield sufficient corrosion resistance and improve weld zone and with the present invention of the primare is preferably included to generate 12 to 85% by volume of **gning/lguot**o the time of the botshing boat (realment as the femile a austomic in inchase legicalitation of a medical (approxiand in the first of the second of the property of the first of the decide of the decide of the decide of the second of the secon steel sheet. Accordingly, manganese has to be resolution in the condingly preferably to 0.5% or less for [0056] According to various exemplary embodiments, nitrogen (N) is an element-which-increases strength of the steel, as with carbon, but a large amount of nitrogen included markedly deteriorates ductility, weld zone toughness, and bending workability. Particularly, including more than 0.02% markedly deteriorates bending workability, and including more than 0.020% markedly deteriorates punching workability of the weld zones. Accordingly, in the present invention, nitrogen is restricted to 0.02% or less, and preferably to 0.020% or less. For better bending workability and punching workability of weld zones, 0:015%, or less is preferable; more preferable is 0:012% or less and even more reduction of P requires a long unse for dephosphodzing at the unse of manufacturing the agels 10,0,010,0, si, eldere agencies of the continue the agency of the continue [0057] vi(Also, for applications where corresion-resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims or the like, nitrogen should be 0.020% or less. For better bending workability, and punching workability of weld zones, 0.015% or less should be included. More preferable is 0.012% or less, and even more preferable is 0.010% or less. . Sullur Q adal criess [0058] In various exemplary embodiments of the present invention, in addition to the above-described basic composition, one or both of molybdenum and copper, and/or boron may be included mexe shorts of philipsock [0300] and generally reduced the company resistance of the size! And is proferably reduced as much asipossible in the ூர்ரு One or both of Molybdenum: 0.1% or more but less than 2.0% and Copper:0.1% or more but less than 2.0% ு the steet which it is estimationable cost. Accordingly the united for sufficient be prosent beenforced for the [0059] Both molybdenum and copper are elements which contribute to improved corrosion resistance, and particularly, molybdenum contributes to improved corrosion resistance of the punch hole shearing face of weld zones. In order to obtain such advantages, each of molybdenum and copper need to be included at 0.1% or more. Moreover, 0.5% or more molybdenum should be included to improve corrosion resistance of the punch hole shearing face of weld zones, but copper deteriorates the punching workability of the weld zones and accordingly the amount of copper should be less than 0.04%. On the other hand, including 2.0% Cu or more saturates the above described corrosion resistance advantages and workability deteriorates instead, so the advantages corresponding to the amount included cannot be obtained, which leads to economic losses. Accordingly, each of molybdenum and copper, should be restricted to 0.1 % or more but less than 2.0%. For better corrosion resistance, 1.0% or more of molybdenum and 1.0% or more of copper should be included. a total and to little out the out minimum its lightly and above it and absent to little out the out of a short of a special and a short of a special as [0060] Also, for applications where corrosion resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims or the like, molybdenum is a crucial element, and 0.5% or more but less than 2.0% need to be included. On the other hand, including 2.0% or more molybdenum; saturates the corrosion resistance advantages and workability deteriorates instead, so the advantages corresponding to the amount included cannot be obtained. Accordingly, molybdenum should be restricted to 0.1-% or morebut less than 2:0%. On the other hand; copper

deteriorates the punching workability of the weld zones, and accordingly should be less than 0.04% restricted accordingly should be less than 50.04% restricted according to the 50.04% restricted accordingly should be less than 50.04% restricted accordingly should be less than 50.04% restricted a

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Boron: 0.0005' to 0.0050% becaloase the little in the little and the series is entitle gate as view and a little one 10069). On a electroniant is the dinomium envival variable, in the above-described randorfusuation (1), or it [0061] @ According to various exemplary embodiments; minute amounts of boron (B) act to increase the quenchability of the steel and increase strength; and also markedly improve the punching workability of the weld zones. Such ad-Pvantages are observed by including 0.0005% B or more. However, including more than 0.0050% causes the corrosion 'resistance:to'deteriorate: Accordingly, boron is restricted to the range of 0.0005 to 0.0050%; For improving quenching, 0.0010% or more is preferably included and for better corrosion resistance for 0.0030% for descriptional for 0.0030% for description for 0.0030% for 0.0 ...[0062]poAlso, for applications where corrosion/resistance and punching workability of weld zones are required, such ≈as use in wheels like bicycle rims or the like; boron is a crucial element; and 0.0005 to 0.0050% need to be included. - For improving quenching, 0.0010 or more is preferably included, and for better corrosion resistance 0.0030% or less mium equivalent excepts the above-described range (squation 199) and the nickel equivalent exceptibilities and [0063] 80 The composition of the stainless steel sheet according to various exemplary embodiments of the present vinvention satisfies the above-described ranges of component elements, and further includes the component elements so as to satisfy equations (1) through (4)! I through the new through the sound of the satisfy equations (1) through (4)! I through the new through the new through the satisfy equations (1) through the satisfy Compar are softed thrule for applications where corrosion read the area principles of white Principles are recurrent. nas planeras reserver in eras en mairionia. El control de la fillionia de la batelladar si de las duction the abcomium entersion is actionally to the content of the content of the commence of the content of th  $1 \le Ni + 30 (C+N) + 0.5 (Mn + Cu) \le 4$ Squation (1) in the range 2.2 to 2.6

 $Cr + 0.5 (Ni + Cu) + 3.3 Mo \ge 16.0 (3) M S = 3.4 \ 3.3 Mo \ \ 2.0 \ 3.3 Mo \ 2.0 \ 3.3 Mo \ 2.0 \ 3.3 Mo \ 3.$ 

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14.0  $\leq$  Cr + Mo + 1.5 Si  $\leq$  15.0  $\frac{14.0 \leq 1.0 \leq 1.$ 

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(8) (2074) The {C + N} in equation (4) (or equation (8) (1.4.7) (2.4.7) (2.4.1) (2.4.1) (2.4.1) (3.4.7) (3.4.1) (4.4.7) (3.4.1) (4.4.7) (3.4.1) (4.4.7) (3.4.1) (4.4.7) (3.4.1) (4.4.7) (4.4.

[0067] it.In the present invention; the (Gra+: Mo + 1.5Si) in equation (1) (or in equation (5)) is defined as chromium sequivalent; and the (Ni+30 (C+N)+10.5 (Mn+Cu)) in Equation (2) (or in Equation (6)) is defined as nickel equivalent. [0068] Restricting the chromium equivalent and the nickel equivalent to that in equations (1) and (2); and heating to the high temperature (850 to 1250°C) and then cooling, yields a mixed structure of ferrite which has excellent ductility

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and martensite which is very strong, so the stainless steel sheet has both excellent ductility and high strengths. [0069] On the other hand, if the chromium equivalent is lower than the above-described range (equation (1)), or if the nickel equivalent exceeds the above-described range (equation (2)), then the ratio of austenite at the time of heating to the high temperature becomes too high, and as a result the amount of martensite generated from austenite transformation while cooling becomes excessively large, and ductility deteriorates: Also, if the chromium equivalent exceeds the above-described range, (equation (1)), or if the nickel equivalent is below the above-described range; (equation (2)), then the ratiosoft ferrite becomes excessively large, and the strength deteriorates with a strength of the strength deteriorates with a strength of the strength deteriorates with a strength of the str [0070] and Further; if the chromium equivalent is below the above-described range (equation (1)) and the nickel equivalent is below the above-described range (equation (2)); then the austenite is transformed to ferrite during cooling and as a result hardenability deteriorates; the amount of martensite decreases; and the strength drops: Moreover, if the chromium equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds the above-described range (equation (1)) and the nickel equivalent exceeds (1) and (1) are the nickel equation (1) are the n described range (equation (2)); then residual austenite which has lower strength is generated instead of martensite, and as a result highestrength cannot be obtained. From the balance, between strength and ductility, the chromium equivalent is preferably in a range of 14 to 15, and the nickel equivalent 2 to 3/buokh (1) anotto upo visites of an oa [0071] Further, for applications where corrosion resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims or the like, the range of 14.0 to 15.0 for the chromium equivalent in equation (5), and the range of 2.0 to 3.0 for the nickel equivalent in equation (6), are preferable. It should be noted that in equation (6), Cu is calculated as being zero when "less than 0.1%" is included. Also, from the balance between strength and ductility, the chromium equivalent in equation (5) is preferably in the range, 14.2 to 14.6, and the nickel equivalent in equation (6) in the range 2.2 to 2.8.

- Equation (3): Cr + 0.5 (Ni + Cu) + 3.3 Mo ≥ 16.0 • Equation (7): Cr + 0.5 Ni + 3.3 Mo ≥ 16.0
- [0072] The left side of Equation (3) {Cr + 0.5 (Ni + Cu) + 3.3 Mo} (or Equation (7), however, Cu is an unavoidable inclusion and accordingly is not included in the Equations) is a factor relating to corrosion resistance, and with the present invention, the amounts of Cr, Ni, Cu, and Mo included are adjusted so that {Cr + 0.5 (Ni + Cu) + 3.3 Mo} is 16.0 or higher. This yields corrosion resistance equal to originate than that of SUS430 or SUS430LX; and further; the corrosion resistance of the punch hole shearing face of weld-zones is markedly improved alt; should be noted that for better corrosion resistance, {Cr + 0.5 (Ni + Cu) + 3.3 Mo} is preferably 17.0 or higher. Also, for better corrosion resistance; {Cr±0.5 Ni ± 3.3 Mo} is ipreferably 17.0 or higher. Existent alternative and punching workability of weld-zones are required; such as use in wheels like bicycle rims or the like, for better corrosion resistance, the left side of equation (7) {Cr±0.5 Nii+3.3 Mo} is preferably 16.0 or higher, and even more preferably, 17.0 or higher.
- Equation (4): 0.006 ≤ C + N ≤ 0.030
   Equation (8): 0.010 ≤ C + N ≤ 0.02

[0074] The {C + N} in equation (4) (or equation (8)) is a factor affecting strength, bending workability, weld zone toughness, and punching workability of the weld zones. In the present invention, this is restricted to the range of 0.006 to 0.030. If {C + N} is less than 0.006, then the strength of the martensite structure is too low, so even if a ferrite + martensite mixed structure is formed, high tensile strength of 730 MPa or more cannot be realized. On the other hand, if {C + N} exceeds 0.030, then bending workability and weld zone toughness deteriorates markedly. It is thought that the reasons is that when the amount of C and N included is great, the difference in hardness between the soft ferrite and the hard martensite becomes extremely large, such that stress accumulates at the boundary thereof at the time of bending, and accordingly breakage occurs more easily. For higher strength, {C + N} should be 0.010% or more, and more preferably 0.012 or more. Also, for better bending workability, {C + N} should be 0.020 or less too entire interesting [0075] Moreover, if (C:+:N):exceeds:0.02; then weld zone punching workability markedly deteriorates: The Teason that weld zone punching workability deteriorates, according to various exemplary embodiments, is that of the mixed structure of ferrite and martensite which is generated after welding, there is a great amount of Crand Ninisolid solution in the martensite from transformation of the austenite which has great solid solubility of Cland N; so the strength of the martensite increases, and the difference in strength with the soft ferrite becomes excessively large (a) not sup I For better weld zone punching workability, {C + N} should be equal to or more than 0.0103but:0:02 or less, more preferably 0.020 or less, and even more preferably 0.017 or less.

[0077] Also for applications where corrosion resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims on the like; {C + N} in equation (8) should be equal to or more than 0.010 but 0.02 or less; more preferably 0.020 or less, and even more preferably 0.017 or less, a regiments of the present invention, is essentially [0078] of the stainless steel sheet, according to various exemplary embodiments of the present invention, is essentially

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formed of iron-(Fe) in addition to the above-described components. The term-"essentially formed of Fe" means that impurities other than Fe are still unavoidably included. Also, up to about 0:1-% of Cu may be included by being mixed in from scrap iron which is part of the material but applications where corrosion resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims or the like; Ou as an unavoidable impurity is preferably kept to less than 0.04%; If! Oureaches 0.04% or more, the martensite excessively hardens in the same way as in the case/where the {@#:N}rexceeds 0:02%; thereby deteriorating the weld zone punching workability. Examples of other unavoidable impurities besides Cu include small amounts (around:0:05%) of alkali metals alkaline earth metals; rare rearthrelements, transition metals, and the like Small amounts of such elements being included do not interfere with the advantages of the present invention driving way, a studed of the sub-ordinary as student entry thio call of the advantages of the present invention of the advantages of the advantage [0079] Gatherstructure restrictions of the high-strength stainless steel sheet according to the various exemplary embodiments of the present invention are described below. The high-strength stainless steel sheet according to the present invention, has a mixed structure of martensite and remainder of ferrite, wherein the martensite is equal to or more than 112% by volume but equal to or less than 95%, preferably equal to or less than 85% and more preferably 20% or more but 80% for less ill the martensite is less than 12% by Volume, ductility is excellent obtaining high strength with a tensile strength of 730 MPa or more becomes substantially difficulted one season is limed to to to the [0080] of On the other hand, if martensite exceeds 95% by volume, strength of a tensile strength of 730 MPa or more can be obtained? but the ratio of ferrite; which has excellent ductility; is too low; so the steel sheet loses ductility; and binding workability deteriorates. For applications wherecorrosion resistance and punching workability of weld zones are required, such as use in wheels like bicycle rims or the like, martensite should be included at 20% by volume or more preferably 50% or more and while increased strength is desirable, 85% or more martensite by volume makes bending workability of forming rims and the like in particular markedly difficultill act to amin aloyoid will aload an alough of a second sold aload. [0081] OCA preferred manufacturing method of the high-strength stainless steel sheet according to the present invention mass of B with the range of Cr All Cr and N. being further comic. To 0 020% by mass or less of wolfd'bédinaeshair [0082] According to various exemplary embodiments, material for stainless steel sheets (hot-rolled steel sheets or cold-rolled steel sheets) is subjected to a finishing heat treatment which consists in being heated to a temperature within the range of 850 to 1250°C, preferably held at this temperature for 15 seconds or longer, and then cooled at a cooling rate of 1°C/s or faster, preferably 5°C/s or faster. The material comprises: the above-described component composition including 0.02% by mass or less of C, 1.0% by mass or less of Si, 2.0% by mass or less of Mn, 0.04% by mass or less of P, 0.01% by mass or less of S, 0.1% by mass or less of Al, 11% by mass or more but less than 17% by mass of Cr. 0.5% or more by mass but less than 3.0% by mass of Ni, and 0.02% by mass or less of N, so as to satisfy the following equations (1) through (4),

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$$\leq$$
 Cr  $\neq$  Mo  $+$  1.5 Si  $\leq$  17. (1)

$$1 \le Ni + 30 (C + N) + 0. \le (Mn + Cu) \le 4$$
 (2)

whorein the contents of C. N. S. Mn. Cr. Me. All and Collection Selbs mass. The material further includes 0.04% or less (S) Du as an un voidable impurity wherein the control of the cont ismbareture with line range of 900 to 1700° C or efortulation of remograture for 15 seconds chlonger and thor cooled at a cooling rate of 510 is or faster (4) 38] The reason why the trashing hour tree, 0.000 cours and 0.000 cours of 2000 cours in the position from persium is lower than 900°C, even if the nearthy termination or the Act transformation point, then the transwherein, the contents of C; N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass, a singleus of stropt most beeds notismos The material may further comprise one or both of 0.1% or more by mass but less than 2.0% by mass of Mokand 0.1% or more by mass but less than 2.0% by mass of Cu, and/or 0.0005% to 0.0050% by mass of B, with the remainder generated by transformation from austenite during not but so conteversiting mission allowed the property of the context of the [0083] The obtained hot-rolled steel sheet or cold-rolled steel sheet is preferably heated to a temperature in the range of 850 to 1250°C, which is the two-phase temperature region (\$\alpha + \gamma region) of ferrite (+ austenite) as finishing heat treatment. According to various exemplary embodiments the heat treatment atmosphere is not particularly restricted; and may be a reducing or oxidizing atmosphere. In the event that the heating temperature is lower than 850°C; sufficient/recrystallization/does/not occur/rand/even in the event that the heating temperature exceeds the Ac1 transformation point the transformation speed from ferrite to austenite is slow, and there may be cases where sufficient martensite cannot be obtained following cooling. is preferable [0084]Στο Also, sin the event that the heating temperature exceeds 1250°C; the ratio of δ -ferrite increases; so the ratio

of austenite is insufficient; and the 12% or more by volume of martensite generated by transformation from austenite

during cooling cannot be ensured. Note that the two-phase structure of ferrite + austenite is stably obtained in the

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temperature range of 900 to 1200°C, and accordingly is preferably heated to this temperature range. Also, heating to 950°C or higher is preferable in order to obtain a uniform structure with sufficient recrystallizations at the contraction [0085] C Also; the hot-rolled steel sheet or cold-rolled steel sheet is preferably maintained at the above heating temperature for 15 seconds or longer. If the holding time is less than 15 seconds, recrystallization may be insufficient, and transformation, from ferrite to austenite is also insufficient, so the desired ferrite + austenite two-phase structure cannot be obtained; and sufficient strength cannot be achieved. It should be noted that from the perspective of productivity of finishing heat treatment/the heating timet is preferably, 180 seconds; or less to allocated as in long, still shows in [0086] State of the continuous exemplary embodiments, this hot-rolled steel sheet or cold-rolled steel sheet is cooled to the Ms point (the temperature at which the austenite begins transformation to martensite during cooling) corclower, preferably 200°C or lower, as the cooling-stop temperature, at a cooling rate of 1°C/s, or faster, and preferably 5°C/s or faster. After reaching the cooling-stop temperature, the cooling may continue at that rate down to room temperature, but there is not particular need for temperature control here, and accordingly the sheet may be left to cool to room temperature. At a slow rate, where the average cooling rate from the heating temperature to the cooling-stop, temperature (average cooling rate), is:slower, than 12C/s, part of the austenite, is transformed into ferrite-during cooling so the amount of ferrite increases, and the 12% by volume or more of martensite generated by transformation from austenite during cooling cannot be ensured; and consequently, the goal of high strength cannot be achieved. In order to ensure stable strength, a cooling rate of 5°C/s or faster is preferable. While there is no particular upper limit set for the cooling rate from the heating temperature, generally 100° C/s or slower is preferable. It should be noted however, that excessively:fast cooling may result in cooling irregularities,, and unevenness on the steel sheet, as uses to be access to see [0087] 3 For applications where corrosion, resistance and punching workability of weld-zones are required; such as use in wheels like bicycle rims or the like, the material for stainless steel sheets (hot-rolled steel sheets or cold-rolled steel/sheets) further includes 0.5% or more by mass but less than 2.0% by mass of Morand 0.0005% to 0.0050% by mass of B, with the range of C, Al, Cr, and N, being further restricted to 0.020% by mass or less of C, 0.10% by mass or less of Al; 11:0% by mass or more but less than 15:0% by mass of Cr, and 0:020% by mass or less of N, and with equations (1) through (4) being replaced by the following equations (5) through: (8); and a second order of an wither the range of 850 to 1250 to preferably neld arrows for confor its educated in the and the confect a a 

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 $Cr + 0.5 Ni + 3.3 Mo \le 16.0$  (7)

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OF.

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 $\Delta > 0.010 \le C + N \le 0.020 + 0.1$  (8)

wherein, the contents of C, N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass. The material further includes 0.04% or less of Cu as an unavoidable impurity, wherein the material is subjected to finishing heat treatment and is heated to a temperature within the range of 900 to 1200°C, preferably held at this temperature for 15 seconds or longer, and then cooled at a cooling rate of 5°C/s or faster.

[0088] The reason why the finishing heat treatment temperature is set to 900 to 1200°C is that if the heating temperature is lower than 900°C, even if the heating temperature exceeds the Ac1 transformation point, then the transformation speed from ferrite to austenite is slow, and the 20% by volume or more of martensite generated by transformation from austenite during cooling cannot be obtained. Also, if the heating temperature exceeds 1200°C inthen the ratio of δ.-ferrite increases, so the ratio of austenite becomes insufficient, and the 20% by volume or more of martensite generated by transformation from austenite during cooling cannot be achieved. Also, heating to 950°C or higherids preferable in order to obtain 50% by volume or more of martensite. The reason why the cooling rate is set to 5°C/s or faster is that; at a slow rate where the average cooling rate from the heating temperature to the cooling-stop temperature (average cooling rate) is; slower than 5°C/s, the amount of the austenite transformed into ferrite during cooling increases, and the 20% by volume or more of martensite generated from the transformation of saustenite during cooling cannot be achieved. While there is no particular upper limit set for the cooling rate; generally, 100°C/s or slower is preferable.

[0090] According to various exemplary embodiments, the hot-rolled steel sheet or cold-rolled steel sheet is preferably subjected to acid wash. The finishing heat treatment is normally performed in a continuous annealing furnace for coils, and a batch annealing furnace for cutlength sheets.

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[0091] According to various exemplary embodiments, the hot-rolled steel sheet or cold-rolled steel sheet manufactured this way is subjected to bending working and the like according to the application thereof, and is formed into pipes, panels, and the like. The articles thus formed are then used as, for example, vehicle reinforcing weld structure materials such as pillars, bands, beams, and the like, for railway vehicles, bicycles, automobiles, busses, bicycle rims, and the like. The welding method for this structural members is not particularly restricted. General arc welding methods such as MIG (metal-arc inert gas welding), MAG (metal-arc active gas welding); and TIG (gas tunigsten arc welding); spot welding, seam welding and other resistance welding methods! high-frequency resistance welding seam welding and other resistance welding methods! high-frequency resistance welding methods! welding, and high-frequency induction can be performed. Addition by 5000 and 5000 and 5000 and 50000 and 500000 [0092] According to various exemplary embodiments, the processes up to before the finishing heat treatment process may be conventional processes, and there is no particular restriction on these processes other than preparing the components for the composition of the molten steel at the time of melting the steel. Methods generally employed for manufacturing martensitic stainless steel sheets can be applied here without change! Preferred processes up to before The finishing heat-treatment are as followed on the color of the rolling direction is partially and the finishing heat-treatment are as followed on the colors are the finishing heat-treatment are as followed on the colors are the finishing heat-treatment are as followed on the colors are the colors and the colors are the colors as followed on the colors are the co [0093] Forcexample ransteel converter of electric furnace of the like is used so as to meet the scope of the present invention, rand secondary refining is performed by VOD (Vacuum Oxygen Decarburization) for AOD (Argon Oxygen Decarburization) so as to produce the steel. The produced steel can be formed into slabs with known casting methods: From the perspective of productivity and quality, continuous casting is preferably applied for slabs. A steel slab obtained by continuous casting is heated to 1000 to 1250°C, subjected to ordinary heat rolling conditions, such as being formed into sheet bars 20 to 40 mm in thickness by reverse milling, and then formed into hot-rolled steel sheets 1.5 to 8.0 mm in thickness às desired by a tandem milli Alternatively, hot-rolled stéel sheets 195 to 8.05mm in thickness as desired mäybe formed with the reverse mill alone. The hot-rolled steel sheet is subjected to batch annealing at preferably 600 to 900°C as necessary, and descaled by acid wash or the like? Also, depending on the application thereof, the hotrolled sheet is annealed and acid-washed, then subjected to cold-rolling to form cold-rolled steel sheets 0.3 to 3.0 mm in thickness. If necessary, the cold-rolled steel sheets are subjected to continuous or batch annealing at 650°C to 850°C; and acid washing For better productivity, the finishing heat treatment according to the present invention is preferably carried out for the hot-rolled or cold-rolled steel, without annealing or acid washing on the hot-rolled or cold-rolled steel, without annealing or acid washing on the hot-rolled or cold-rolled steel, without annealing or acid washing on the hot-rolled or cold-rolled steel, without annealing or acid washing or acid more benieffic and [0094] To The present invention is described in further detail, according to the exemplary embodiments below: shown in Fig. 3. Teating is porformed conforming to the strongular of the 2.2242 at 50°C, the absolution energy is calculated, and the wald-heat-aftertene toughness is the contact as value vE.so (J/cm2) obtains 234MAX3 the abourplion onergy will by the engined socronieses of the live in the sverage of the five specimens is taken as the value to the side sheet. A VE st of 40 word of the weld-heat-affected zone inheldmaxasufficient for practical use.

[0095]: With the hot-rolled stainless steel sheets of the composition shown in Table 1/or Table 2 as material, finishing healt treatment processing is performed by a batch annealing furnace of the conditions shown in Table 3 or Table 4, and then washed with acid. The obtained steel sheet 3 mm in thickness is subjected to (1) metal structure observation; (2) tensile testing; (3) corrosion testing; (4) bending testing; and (5) weld-heat-affected zone toughness testing. The testing is as follows. Note that the hot-rolled steel sheet which is the material was made by heating at 100 kgfting of of steel of molten in a high-frequency furnace to 1200°C, and finished by hot-rolling to a thickness of 3 mm by a reverse mill.

#### (1) Metal Structure Observation

and to seed on the proporties of cold-rolled steel shears are considered steel shears of cold-rolled steel shears. (Sizês'i (same thickness) X 10 mm X 10 mm) for metal structure observationals taken from the obtained steel shear, a cross-sectional cut face parallel to the rolling direction is corroded with Murakamirleagent (alkali solution of red prussiate\* (10 g of fed-prussiate\*, 10 g of caustic potash, and 100 cc of water)), the micro-structure is observed using an optical microscope at 1000 times, five fields are taken of each; the structure is identified and further therarea percentage of the martensite is obtained using an image analyzing device, with the average of the first intensite structure. If your is easily and it is a start areas and firm of the ABB to the round of the martensite structure. If your is less to believe that it is entered to have a constant of the martensite structure. If your is an animal most of the percentage of the martensite structure. If your is an animal most of the percentage of the martensite structure. If your is an animal most of the percentage of the martensite structure. If your is one is an animal most of the percentage of the martensite structure. If your is an animal most of the percentage of the percentage of the martensite structure. If your is an animal most of the percentage of the martensite structure. If your is not percentage of the percentage of the martensite structure. If your is not percentage of the percentage of the percentage of the martensite structure. If your is not percentage of the percentage of the martensite structure. If your is not percentage of the percentage of the martensite structure. If your is not percentage of the martensite structure. If your is not percentage of the martensite structure. If your is not percentage of the martensite structure. If your is not percentage of the martensite structure is not percentage of the martensite structure. If your is not percentage

(3) Corrosion Test

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[0098] Two corrosion specimens (size: t X 70 mm X 150 mm) are taken from the obtained steel sheet, and cyclic corrosion testing (also known as CCT) is performed under the following conditions with one face thereof as the testing

thetensile strength (TS) and elongation (E1) which were averaged lion-blooted bermined at it autitions to adopt

face. Following the test, the specimens are immersed in concentrated nitric acid of 60°C to remove rust, the number of points of rust on the test face is counted visually, and averaged between the two specimens, thereby evaluating the corrosion resistance of the steel sheets. Nine or less rust spots means corrosion resistance with no problems for practical use, sessual sendomonus sendra en asentantes en as ordination, emesa sonea sisting as notes his diam. Corrosion testing conditions: five cycles of the following cycle; காக கொகவாக உள்ள நம்கள் நாக்கள் கள் கள் காக கர் நட [0099] v.Misting.with saltywater (5% NaCl solution at 35°C) for two hours, combined the constraint Covins about [0,100] and drying for four hours (60°C and relative humidity of 30% or lower) and dro has both for head, without hours [0101] wetting for two hours (50°C and relative humidity of 95%) கவ வி எல என்றும் முற்று இரு அரு முறிய வரி [0092] According to various examplery embodiments, he are leases up to before the finity and heaf treatment process (4): Bending Test it notice accessors open the inclination of the entire of an attended to the entire test of the entire test o combonants for the composition of the malter steel a little or making the steel. Methods generally shiplayed for [0102] Three specimens (size: t X 25 mm wide X 70 mm long) are taken from the obtained steel sheet such that the longitudinal direction is parallel to the rolling direction, subjected to 180° bending with an inner radius, of 0,75 mm, 1.5 mm; 2.0 mm, and 3:0 mm; following which the outer side of the bend is observed with a magnifying; glass to inspect of-cracks, and the minimum bending inner radius (mm) with no cracking occurring is obtained. Smallest bending inner radius of less than t (e.g., less than 3.0 mm in the event that t = 3.0) means bending workability, sufficient for practical use. From the norselective of productivity and quality continued in which is creferably applied for slabs. Acted slah obtained (5) Weld-Heat-Affected Zone Toughness-Test- and the conduct of the first of the fir into sheet bars 20 to 40 mm in thickness by reversit milling intrinsmed into hot-rolled steel sheets 1.5 to 8.0 mm. [0103] Two specimens (size: X:150 mm) wide X:300 mm long) are taken from the obtained steel sheet for fabricating joints, abutted with each other so that the faces of the sheets in the thickness direction thereof parallel in the rolling direction face one another; and welded together so as to form a welded joint by MIG welding. The conditions for MIG welding here are JIS Y308 for the wire; electric current of 150A; yoltage tof 191/swelding; speed tof 9: mm/s; shielding gasjof Argonol 00 percent by volume at a flow of 20 1/min, and root gap of 1 mm. otop entities each in asserbent in [0104] sa Five USZ 2202 No. 4 subsize Charpy impact testing specimens (size of 0 mm thick X tiwide X 55 mm long) are obtained from the obtained welded joint by machining such that the longitudinal direction of the specimens is parallel to the width-direction of the steel sheet. A notch is formed at a heat-affected zone 1 mm from the binding portion as shown in Fig. 3. Testing is performed conforming to the stipulations of JIS Z 2242 at -50°C, the absorption energy is calculated, and the weld-heat-affected zone toughness is evaluated from a value vE\_50 (J/cm²) obtained by dividing the absorption energy value by the original section area of the notch base. The average of the five specimens is taken as the value for the steel sheet. A vE-50 of 40 J/cm2 or more means that the weld-heat-affected zone toughness is sufficient for practical use. -

[0105] if The results of the tests are shown in Table 3 and Table 4 a Each of the examples according to the present invention have high tensile strength of 730 MPa or higher, excellent corrosion resistance, and excellent bending workability and weld-heat-affected zone toughness. On the other hand, with the comparative examples which are outside the range of the present invention; either the tensile strength is less than 730 MPa, corrosion resistance is deteriorated, bending workability, is deteriorated, or weld-heat-affected zone toughness is deteriorated; show swell as a price of the example 2 and the search of the search o

(1) Maial Structura Observation

[0106] The properties of cold-rolled steel sheets are inspected. A hot-rolled steel sheet 3 mm in thickness, of the steel-No. 4 K in Table of from the Example of is subjected to annealing of being held of 700% of for 10 hours and then gradually cooled; and descaled with acid wash. The hot-rolled annealed sheet is golled with a reverse mill by cold rolling to a thickness of 1.5 mm; subjected to finishing heat treatment of being held at 1000% of 30 seconds, and then cooled to a cooling-stop temperature of 100% cat a rate of 15%. C/s, and descaled by immersion in a 60% of mixed acid (10% by mass of nitric acid + 3% by mass of hydrofluoric acid), thereby obtaining a cold-rolled steel sheet with a thickness to 1.5 mm. The same tests as the hot-rolled steel sheet in Example 1 are performed in this example, a muloy ent 2.5 [0107]. The only difference is that the welding for testing weld zone toughness is TIG welding (electric current of 95A, voltage of 11v, welding speed of 400 mm/min, and flow of shield gas of 20 liters/min for front (electrode) side and 10 liters/min for rear side. The results show that the martensite percentage by volume was 73%, CCT rust count is zero, smallest inner bending radius is 0.75 mm (1/2t), i.e., half of the sheet thickness; t). Tensile strength is 975 MP agand breaking elongation is 10%. Weld-heat-affected zone toughness show the Charpy impact testing value (vE<sub>250</sub>) at 50% to be 70 J/cm². Thus, it is confirmed that cold-rolled steel sheets have approximately the same properties as hot-rolled steel sheets.

13° Concern Test

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Example 3

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Uting this leads leads benefit out most restaurable to the first of X files as a removed relacable of \$8000]. [0108] A Finishing heat treatment with a batch annealing furnace under the conditions shown in Table 7, and Table 8.

is performed on stainless cold-rolled steel sheets of the composition shown in Table 5 and Table 6, and washed with acid. The obtained steel sheet having thickness t of 0.7 mm is subjected to the (1) metal structure observation? (2), tensile test, and (3) corrosion test, as with the Example 1. The cold-rolled steel sheet used as the material is manufactured by heating a 100 kgf ingot of steel of the composition shown in Table 5 and Table 6 molten in a high-frequency furnace to 1200°C, finished to 3 mm thickness by hot rolling with a reverse mill, subjected to annealing of being held at 700°C for 10 hours and then gradually cooled, descaled with acid washing, and then the hot-rolled annealed sheet is rolled by cold-rolling with a reverse mill to a thickness of 0.7 mm.

[0109] Fig. 2 shows a structure photograph taken with an optical microscope of the steel sheet No. 2-1 (Table 7), as an example of the (1) metal structure observation results. The black portions are the ferrite structure, and white portions are the martensite structure. The volume percentage of martensite structure in this view is 73%.

[0110] The results are shown in Table 7 and Table 8.

[0111] Further, two seam weld zone punching workability specimens shown in Fig. 4, assuming a bicycle rim such as shown in Figs. 5A through 5C, each t X 50 mm wide X 300 mm long are taken from the obtained cold-rolled steel sheet, the two were overlaid, and subjected to seam welding in the lengthwise direction with an automatic seam welder, under welding conditions of electrode width of 6 mm, welding speed of 120 cm/min, application pressure of 3 kN, and welding electric current of 8 kA. Five holes, 4 mm in diameter are punched at 50 mm intervals from the edge of the obtained welded piece along the middle, assuming bicycle spoke holes. After punching, cracks are inspected for around all holes at a magnification of 10 times with a magnifying glass. Also, the specimens following breaking observation are then subjected to corrosion testing in the same may as with (3), and whether or not rust at the hole portions (punch shearing faces) was observed by eye. While this seam weld tone punching workability test is specifically performed with application to steel sheets for bicycle rims in mind as shown in Fig. 5, application may be made to other usages in the same manner.

[0112] The obtained results are also given in Table 7 and Table 8.

[0113] Each of the examples of the present invention satisfying the suitable range for applications requiring corrosion resistance and weld zone punching workability, application to wheels for example, have high tensile strength of 800 MPa or higher, excellent corrosion resistance, no cracks are observed in punching of the weld zones, and the hole faces of the punch holes have excellent corrosion resistance. On the other hand, examples of the present invention outside of the suitable range (indicated by being in brackets []) for applications requiring corrosion resistance and weld zone punching workability, application to wheels for example, either have a tensile strength of less than 800 MPa, exhibit some deterioration in punching workability of the weld zones, or exhibit some deterioration in the corrosion resistance of the punch hole portions.

#### Example 4

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[0114] The properties of hot-rolled steel sheets are also inspected. The hot-rolled steel No. A in Table 5 from Example 3 is subjected to finishing heat treatment of being held at 1000°C for 30 seconds and then cooled to a cooling stop temperature of 100°C at a rate of 30°C/s, and descaled by immersion in a 60°C mixed acid (15% by mass of nitric acid + 5% by mass of hydrofluoric acid), thereby obtaining a hot-rolled steel sheet with a thickness t of 2.0 mm.

[0115] The hot-rolled steel sheet used as the material is manufactured by heating a 100 kgf ingot of steel of the steel No. A composition, shown in Table 3, molten in a high-frequency furnace to 1200°C, finished to 2.0 mm thickness by hot rolling with a reverse mill. The sheet is subjected to the same tests as the cold-rolled steel sheet in Example 3.

[0116] The obtained hot-rolled steel sheet is subjected to the (1) metal structure observation. (2), tensile test, and (3) corrosion test. Further, two seam weld zone punching workability specimens, each t X 50 mm wide X 300 mm long, are taken from the obtained hot-rolled steel sheet, the two are overlaid, and subjected to seam welding in the lengthwise direction with an automatic seam welder, under welding conditions of electrode width of 6 mm, welding speed of 100 cm/min, application pressure of 7 kN, and welding electric current of 12 kA. Five holes, 4 mm in diameter are punched at 50 mm intervals from the edge of the obtained welded piece along the middle, assuming bicycle spoke holes. After punching, cracks are inspected for around all holes at a magnification of 10 times using a magnifying glass. Also, the specimens following breaking observation are then subjected to corrosion testing in the same way as with (3), and whether or not rust at the hole portions (punch shearing faces) was observed by eye.

[0117] As a result, the volume percentage of martensite structure is 75%, and the CCT rust count is zero. Tensile strength is 920 MPa, and breaking elongation is 12%. No cracks are observed in punching of the weld zones, and the hole faces of the punch holes have excellent corrosion resistance. Hot-rolled steel sheets thus have approximately the same properties as cold-rolled steel sheets.

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[0118] According to the present invention, high-strength stainless steel sheets with high tensile strength of 730 MPa or higher, and excellent corrosion resistance, bending workability, and weld zone toughness, and further high-strength stainless-steel sheets with excellent weld zone punching workability, can be provided easily and inexpensively, thus yielding marked industrial advantages. The high-strength stainless steel sheets according to the present invention can

be applied to usages requiring corrosion resistance and weld zone punching workability, such as application to bicycle rims, unicycles; carts, using spoke wheels, tricycles, wheelchairs, and the like productions that is the deconstruction rainch fost and till, in callon that his light that exercise Control of suggestion on the first manager of the means table collection of the kerings of size of the document of the blade band. This is observed ingle tradences ched conserva gottoerone jubiconolos. Who exister in the adoption on asometration to or performing Contest or men el rosita da Benno bellos de um portibus gridas a como composar a compositivo de escar de notación de escar de co er milled by Leta military with a revense mill to a chiconast and the funds). Fig a shows a ununture uharequiable terchively and the ecope of the steel heart for Political fundations of the first form of the an example of the (1) metal structure observation rast it. The inself continue are the fed to a ructure, and virule portional are the manchalt, structure. The volume percentage of marches in order military view is 78%. 10 Pitt0; The results are shown a Time I and Table I 101/11 I Eurither two seam wells cone purcling that have the ing an intermediagram angalambasa i ki mePilim disebahan ganac capwin in Eigel 6A through 6C, dath tix 60 mm wild in the might are taken from the coralned collected eree shept that wo were overlaid and subject of to scan, we have the other with an automal caseam virial and unider welding conditions of electropy units or 6 mm, with and the town appropriate algorithms of the pro-वर्तने हैं के किया मार्च कर है। ते हैं के किया में किया में किया है किया के लिए हैं किया के लिए हैं welding engine current as a few Europe a published compare to be becaute and a sector of the entire to a sector of the contract o obtained welded bisec along the mirror is asymmetric to the term of the first that the element of the still part and a fix of the constreade conserva generally and second estidiwhather or not rust at the hole homous founch, are then subsected to commence testing it the same two in the cabing workefullity test is specifically performed: shearing faces; was observed by evo fability that so, o was think Fig. E. applies than may be made to other usable. with application in sleet sheets for blower mas in nord as in with randam amay adt m to the collains, results are also given the colline of the property of the collains and the colline of the collains and the colline of the co portion and the examples of their lead invention calcium of the acteriance to add the segment of the processor resistance and weld cone to notice, vortability to the exist will be lot eximple, new high tensity scientifical 800. MPs or bigher excellent correspondence no change of the correspondence of the west, ones are the autoa charged the part of the expension of the contract of the contract of the exercise of the exe outsian in and complete and coloring and a coloring and a coloring and a specifical resistant and a season of the coloring and a sea aPM COF art sealts disperts allacet a over the common to the control of the contr Therefore a transfer of the transfer of the second section of the section of TO BY AND KOME OF THE COMPONION OF THE COMPANION resistance of the punch note of times

#### Example 4

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TABLE 1

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CHEMICAL COMPOSITION (* BY PASS)  WAIDLE AREN RECREATABLE (*) BEIG (*)  UCCOTZ ACREZIAGOZZA (** CONTACT ACREA (*)  OCOTZ ACREZIAGOZZA (** CONTACT ACREA (** CONTACT ACREA (*)  OCOTZ ACREZIAGOZZA (** CONTACT ACREA (** CONTACT ACREA (*)  OCOTZ							ກິວ	ı	1			E - L		0-10	1	.3	1-1	1.22			90.0.	1.88		1.53	4	9	1	1	٠,	• 1	1	-
CHEMICAL COMPOSITION (* BY MASS)  *** **HIDDITE_LEEPN : R ECHVALLANE (*) *** *** *** *** *** *** *** *** ***							m	- (0)	J	* 6.6.5 A		-	0.0012	0	0.0035	0.0033	0.0034	0		0_0_018	0.0	Ö.	200	005	•	•	.002	•	.002		.002	,
CHEMICAL COMPOSITION (% BY MAE  ** MIDDIE AREM IN ECRYLLONE (%) ******  ** MIDDIE AREM IN ECRYLLONE (%) ******  ** OCTOOPT GENEZI MOTZBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000077 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000077 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000077 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000078 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000078 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 0000078 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,2.43) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,24,24,24) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,24,24) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,24,24,24) (C+++) 0 000078 JGTCSBYLDCOZZI OLOOM (14.84,84,24,24,24,34,34,34,34,34,34,34,34,34,34,34,34,34							} -	0(.,0088	•	0-0065	0-0058	-00069			9900 0	0.0055	0.0061	0	0_	0	Ó	0_	Ó	· •	1	•	•	•	• '	•}`	0	
CHEMICAL COMPOSITION (% BY OLD (%) VELO				1A33)				18	0,,005	0.00	-0-011-	-0005	9	0					٠.			0_			•	•	• 1	4 0	•	0.003	1004	£ 50
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CHEMICAL  CHEMIC				CAROS		-2.5 -4.5	<u></u>	1.4	(113.	7		+	نا	+	13	╬╌	╂╼	=	+-	1.5	<del>  -</del>	; F 4	11 W -	14	15.	13.	13	13.	13.	.13.	10.	
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\* MIDDLE TERM IN EQUATIONS (1) AND (5): Cr + Mo + 1.5 Si

\*\* MIDDLE TERM IN EQUATIONS (2) AND (6): N1 + 30 (C + N) + 0.5 (Mn + \*\* LEFT SIDE IN EQUATIONS (3) AND (7): Cr + 0.5 (N1 + Cu) + 3.3 Mo

\*\*\* MIDDLE TERM IN EQUATIONS (4) AND (8): C

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10					6. AL	VALUE OF	LEFT SIDE	NIGI	EOUAT	(3). AND	15,61		? • I		17.6				; • [			22.2	Į l .	1-34	1-0.7		TE S	0.31		er salvedge gen er yn de glysger d	Salah Salah Salah Salah Salah Salah Salah		Control of the contro	THE THE	The second second section is
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15				,	Para ayar	VALUE OF	7 1	TERM IN	EQUATIONS	(I.) AND	(5) 21	1.24	14.6	14.5	14.5.	i • i	14.8	9.1	7.15:1		. <b>.</b>	i • 1	i		7.4.7	1-08-1	16.5	Special Control of the Control of th	de de la companya de	garan, garan, and and and and and and and and and and	was and	The state of the s	TA THE STATE OF TH	CENT OF THE	A N THE THE PROPERTY IS NOW THE THE PROPERTY OF THE PROPERTY O
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		PROPERTIES		ELONGATION	3-4	(8)	10	1.5,	1:0;	<b>∂</b> 6	13	10	6	10	10	1.4	0T	15	10	11		4 to 1			<b>(1,9</b>	12		12	- year 6	10	
		TENSILE P		TENSILE	33.6	(MPa)	11,32	(b,L'L )	1187	1001	90.43	1031	959:	109.8.	11/15	7.8.5	8.2.5/	7.5.5	1037	931	12,0,0,1 0,0,0,1	200	708	8.1.5	1715	956	3.5×955	961	11.89	905	
	臣 3	STRUCIURE		MARTENSITE	0 -	VOLUME)	820	1,6	95	8.19	50	84	75	€08	83	22	510	1.8	8.2	02	96	0 /	7	5.5	1.0 921	75	WELLING I SK		<u> </u>	N 504.6.	
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		CONDITIONS		COOL-TO TEMPERATURE	100	((3:)	100	1.00	100	1003	100,	1003	1,00;	1,00;	1,00	100;	1001	1003	1.003	100	1.00,	100	OOT	NOT	OU.	200	001	100	100	Trum 100041	
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	•		व सहस्रका	HOLDING	3.9	(0)	30		,09	1.30	i 20%	30,	30	30	30	30,	30,	301	30)	30)	30)	30)	30	30,	n	000	30,	30	30	HE130 1.11	16
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"EX.; EXAMPLE ACCORDING TO PRESENT INVENTION C. EX.: COMPARATIVE EXAMPLE" 君

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			REFERENCE			EX	TEX T	EX	C. EX.	C. EX.	C. EX.	CEX.		C. EX.	•	C. EX	C CX	151	C. EX	C. EX.	C. EX.	C. EX.		C. EX.	G. EX.		1° smalfin . Lap	- Norge	
	TOUGHNESS OF HEAT- AFFECTED	-SONES-	-v£_50		(J/cm³)	1.1	56.	45.	11	58	46	1.4	. 85	5.4		135	16	7.8	93	9.4	41	15	131	12.56	13	:	2 der 1	Welltann Ce 5703	
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LE 4	STRUCTURE	n n n	MARTENGITE	25.	(% 2BY		83	40	8.4	68	7.9	7.	100	81	. 80	100	7.2	8.1	7.8	SÞ,	10	91	100	1895 :011	10	A WARLEHOLLS		นสบาบหน้าย	** * ** * * * * * * * * * * * * * * *
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•	VALUE OF MIDDLE TERM IN EQUATIONS (4) AND (8)	* * *	0.014	0.017	0.011	0.012	0.018	05013	090132	0.013	0.00.	( 00016°	0.0124	0.101.7	t noorias	0 0011	07.020:3	1 040138	; 0;025 k	7.91000	1 0.01-7	11.0.020 E	0100011
	VALUE OF LEFT SIDE IN EQUATIONS (3) AND (7)	* * :	17.6	17.5	17.6	18.0	18.2	17308	17.00	17.2.	17350	16.35	17.22	17:69	76121	6 2 / 8 I	72721	17.88	62(8I	16:02	18, 0,	T) [6],91[F]	Free 18 25pr
	VALUE OF MIDDLE TERM IN EQUATIONS (2) AND (6)	* *	2.5	2.6	2.4	2.4	2.9	2.51	2.54	252%	2353	1 255	256	2 50 2	2.55.2	3 30 3	2578	2,55¢	3 20 8	2.543	225	1,12,20,0 161	MICAS TEN
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\*\* MIDDLE TERM IN EQUATIONS (1) AND (5): Cr + Mo + 1.5 81

\*\* MIDDLE TERM IN EQUATIONS (2) AND (6): N1 + 30 (C + N) [1+] 0 [5] (Mn + + \*\* LEFT SIDE IN EQUATIONS (3) AND (7): Cr + 0.5 (N1 + Cu) + 3.3 Mo

\*\*\*\* MIDDLE TERM IN EQUATIONS (4) AND (8) :

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10		WAT IIP OF	LEFT SIDE IN	(3) AND (7)	*(***)	1795	65415	1789	117:7	6:21;	117.5	115:8	11777	11874	117.8	117.5	12006	11779	~ ! • !		3.75		13 . T. J.	\$\delta \text{2} \delta \text{4} \delta \text{4}	(2) WHE (2)	SCAVISCAR PER SIDE AN	
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20		- 1	MIDDLE TERM IN-EQUATIONS		yang di A	D:01.1	1.145.6	114.6	11486	14.5	14.5	1443	<b>5.61</b>	15.3	11437	1.131.9	1.147.6	16.0	7	The state of the s	77 17	) (in)	CZ: Pippi buy	*	Signal Si	THE LEASE ASSESSED.	70 715 701
25			1.003.1	0.0029	0 B) 0.5 1 Cu	000002	090023	0000034	00,0018	01:0058	0!:0023 0.05	000028	- 1.610000	0:0014	000021-	000001 =	0000254	0000191	1100.0	Mn + (Cu)	30Mouse	6.0078	-   2100 9	32	The state of the s		The section of the se
30	HAT!		1831, 0.0121	7110.0 100.0	vo.c.N.O. b.f.ct.	115 000073	046: 0.022	.600000 .600	003: 010126	005: 0:0081	10	04 0024 0:0098	0051 000048	033 00001	005-000063	0044 0000814	00016- 000072:	000054 00000	1,0 <b>5</b> 0810 - 0062	H) (4: (0) 5 (Mr	N4 041Cu) (413.	2800.0 800°	CTOV. C OFOC	A STATE OF THE STA	e de divinación de communicación de differención de descripción de communicación de communi		TIENT
<i>35</i>			TION (& BY MA	0.52.1.59.0	NT -   MOO!	103 1003 00	594: 11.10: 00	8	Ö	88 1115 0	1:05 0	-	119 1005 00	128 1919 09	1115-09	8 17.24 00	1.08. 20.25	166 0955 00	SCEST TIMOUT BI	3) 0E. + TN.	SCr1+0035 (N	(B) 3 C + 9N 0	0.10.1 50.5		(b) Andread marks advisory manys an order of the state of	Fredrich State Control of the Contro	A CONTRACT OF THE PROPERTY OF
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45	THE CONVESTORS (	1	DIMENSO TENT	7.87 0.020	Mn. L. L. D. P. S. C.	08 017	24 0 0 0 2 2	10/ 09 0224	23 00 0230	24 0 024	14 0 021	22 0 029	18, 0, 021	42' 09 029	1.14 00 021	24 00 024	00.021	07,070	PECUATIONS	N EQUATIONS	DEQUATIONS	10IN DEGUATIO	PS B 31.9	W.L. D.	agine attaquementhista e infantitiones		ure i y all per l'étable e partie e partie e partie de l'étable de l'étable de l'étable de l'étable de l'étable
50	ASSER MESSER ASSERTING	E	D. E. SERN. H	0.682 0.53	Rais, Franc	6.1.0	201	La 1 00	21.600	0.12	00 2 4	00 481	0.15	0.22	00 2.5	00.1/8	00, 16	0.08	MTDDIE TERMSINGEOURTIONS	* MIDDLE TERMIN EQUATIONS	LEET, SIDE, IN EQUATIONS	MIDDLE TER	0.050 41.0 21.0 230.0	The state of the s	Andreas		mayora (1-) m oo ayaa ayaa iyo yaayaa dhaala dhaa ayaa ayaa ah
55	ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο ο	A STATE OF THE STA	STEEL	NO.		L'Y D'E	1	]		;							i	-	<b>}</b>	į 🛊	**	*				C (9)	

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		REFBRENCE			(:EX.!	L[BX?]	(BX.)	l'ex J	(EX.1	F. Ex.	G'EX.	·ex.	ı. EX.	EX.	EX.	; ; <b>EX</b> .	EX.1	EX	C EXT	{ - EX ]	LEK.	[EK.]	EX.	EX.	EX.	EX.	EX.	e commente como con	
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	PROPERTIES	ELONGATION	7.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1	(*)	2, 8,	25.6	10%0	Z; 6;	10.0	10 B2	. 0568	9,13	9.5	8.4	.9.3	.8.1	0; 6)	0 : 8:	B - 8	S, Ln	1 0 ± 6 j	17:6	9.7	8.5	7.5	7.5		WORKABILITY	* F
	TENBILE	3 5 6	CHING AC	(MPa)	929	3788	1765	950	17.68	91.5	922	. 925	\$06-	, 688;	. LZ8:	1982	1852	1944	626	1962	4834	1 833	1, 822	516	12:10:38:6.1	3 08.6x 4x	966 F	PUNCHING W	
	BIRUCTURE	MARTENSITE	ica kiju ba	VOLUMB)	£41	9,1,	21,	150	91;	89	02::	70	89	£9;	09;	17.4	767	178	272	177	757	×55	h(H 1572)	67	83	7.3		REBISTANCE AND P	1
)E	918	TYPE	ATHER	2	Σ +	** **	<b>H</b> + <b>B</b>	H + B		H, + 10	F. +, B	H + H	H, +, B	H + B	M;+. 10	H, +, 10	M <sub>7</sub> +, D	M + M	₩.+. ъ	H 4 + , 10	M + 10	ы <u>,</u> +, ъ	H + 10	и́ + ю	A (+, ₽	α + M	H_+_n	EBISTA	Car Car
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			TREBRIC	. X.7	. )(;;	. eg ::	(EX.)	[EX.]	(EX.)	C. BX.	C. EX.	18X.1	{EX.}	[EX.]	[EX.]	C.EX.	[EX.]	C.EKX.	[EX.]	[EX.]	(EX.)	(Ex.)	C. SEX	(EX. 1	.,,	ga 14 an		10 . 20 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 .		;	
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	WELD SONE PUNCHING WORKABILITY	номе	3404	5001	Alice 4	CRACKING	OBBERVED	NONE	HONE	HONE	OBSERVED	OBSERVED	OBBERVED	OBBERVED	OBSERVED	NONE:	OBSERVED	RONE	NONE	NONE	NONE	OBSERVED	OBSERVED	OBSERVED	ebalana E	8	-		ROMEY DITTER	Since alima	
•	CORROSION.	The state of the s	CCT RUBT	COUNT		(NUMBER)	10	6	į <b>8</b> 1	. 7.	. 0	(9	1.		11,	7,	7.	10	1:	1 0,	1,	1 m	0.	0	(ADSHDA)	OF WELD CONES			ANTOCHADA TOTALATA		
	ensile Properties	1	4	ELCNGATION	7 7	(1)	18∶€	8:31	8,02	7.5	€ 3.5	9.0	4.8	7.3	4.5:	B.0:	43.13	6.53	9; 6;	9050	9.7	696p	4.91	6.8		MORKABILITY	H. Persone L. C.				
	Tensile "	1 0 C		<u> </u>	, ju	(MPA)	1171	928	9575	197	1125	1023	1047	\$ 863°	1035	984:	1078	.506	198	755	1301	1097	1043	74.0		PUNCHING W	THE SECTION OF THE SE		SS) The self self self self self self self sel	-	
	etavėturė <sup>()</sup>	*	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hartens (Te	123	VOLUME)	-06	673	763	20.	100	162	75.	. 56	8.73	103	89.	15,	16:	.BI	121	₹56	729	14.	TENTAL CO	AND	PERMERALL	***************************************	नेष्य । स्टब्स्य इ.स.	And the second of the second of the second	
LE 8	A CONTRACTOR	4 1	7=	F. Bakr	7,	1	£ + , 5	E + , E	H. + , B	N + D	ΣΙ	я + ж	H ;+ ,5	4 H	H + 10	M,+,10	й + 'й	H + 10	+	H + 10	ά*.+* μ	H + 5	H + 5	α + + H		REBIBTANCE		and an analysis of	271 - 271		一日
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		10.0	NO.	1 =	-2	-	2	E .	20	H	) 5	\hat{\dagger}{\dagger}	2	77 <b>×</b>	٤	22	A	BA	5	A	EA	47	ह	E		<del>,</del> ,,,,,,,,,	<u></u>	~~			
		STEEL	SHBET	S - S	3 80	1 172	2=24"	2-25	3-26	2-27	.92-2	2-29	2-30>	2-31	7-32r	2-33	2-34	2-35	2-36	2-37	2-38	2-393	2-40	1-41			:	Turk Turk Turk Turk Turk Turk Turk Turk		1 1 2 3 3 3 3	•
		् <sub>रि</sub>	ิต			ب ب خواد	1.74	1.50	1.5	1.0	14	٦	1.0	10	1.7	~	1.74	٠٠٠.	1.50	1.64	1.79	177	.54	, <b>rv</b> ,	J		·	dnade Mass	one primeries of a second		

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Clain	ns .	or table mandle in the second co-		
1. A	high-strength stainless steel sh	eet, comprising:		•
, t				
•	a composition including			
	0.02% by mass or less of C,		•	
·41	1.0% by mass or less of Si,	term of the state of the state of		
11	2.0% by mass or less of Mn,	10 0 - 74 0 30 to 0	•	
	0.04% by mass or less of P.	·	•	
	0.01% by mass or less of S,	We be each Champing or make	a because the comments of C. P. St. Mr. C.	
	0.1% by mass or less of Al,		ead wherein said structure include	
	11% by mass or more but les	s than 17% by mass of Cr,	rounded in a section of a section of the filter	
٠	0.5% by mass or more but les	ss than 3.0% by mass of Ni, and "	correction teacher are restricted by a	
स्वाक्षत्य	েং০:02%by mass of less of Na		and which in recomposition of he	
	•	14 2 2 14 14 14 14 14 14 14 14 14 14 14 14 14	य के अमेरि भागम तमा विभागत के हैं । एक दिन के	
	so as to satisfy the following		•	
	tO o safur vol 1919 0 nartiges	ស់ ព្រះមាទាក្រភ្នំ ឯកាតា <sup>™</sup> លក្ខុជា កែក	a mara isan assima a di crisita-noid billi il a	•
এইয়ে ট	S whereir said storic feet is a	12≤Cr+Mo+1.5.Si ≤17	The high-strongth starctuse steel shoot a	)
			रामाणामा । में इस्टाह इस्टाइडरीने आहे माम्माराईड	
		1≤Ni+30(C+N)+0.5(Mn+Cu	ม)≤4 (2)	)
lod a	io 5 wharein said steel stidet is	according to any one of Olaims 1	7, The little stephala standars seed sneed a	-
		Cr. D.E (NI), Co.), OD Ma. > 1	osda isaec steet	
		Cr+ 0.5 (Ni+Cu)+33 Mo ≥ 1	<b>X</b> **/	)
club s	el loone boile bille merady 3 of	eccording to any or of Chams of	5 The high-strongin stainless siee sheets	!
	•	0.006 ≤ C + N ≤ 0.030	romer steet shee.	
			(4) 9. A manufacturing mothod for a high-stren	
	and the remainder essential	<del>-</del>	Fincluding 12 to 95% by volume of martensite มูกโปษาจุด กิดเปียงสกุจกุล	1
2. T	he high-strength stainless steel s	sheet according to Claim 1, where	in said composition further comprises at leas	<b>+</b>
	ne of:	most according to claim 1, who co	O for each to each ad 850.0	L
_,		•	1.0% by mass or total of Si	
	0.1% by mass or more but les	s than 2.0% by mass of Mo, and	2.0% by mass or lose of Mn.	
	0.1% by mass or more but les		0 04% by mass or less of P	
•		,	0 64% by mass or locs of S	
	he high-strength stainless steel : omprises:		ims fhòr 2 awherein said còmposition further	r .
			skel jud snom no saam vid 86 C.	
	0.0005% to 0.0050% by mass		102% to 11888 or 1889 of th	
4. Ti	he high-strength stainless steel s	sheet according to Claim 1, where	in said composition further comprises:	
	0.5% by most or more but less	on them 2 00% by mone of his and		
F }	0.0005% to 0.0050% by mass	s than 2.0% by mass of Mo and		
	•	d N, being further restricted to		
. ~ 1	0.10% by mass or less of Al,	OF NAMED OF NAME OF THE OF		
	•	ss than 15.0% by mass of Cr, and	1	
<u>?)</u> }	0.020% by mass or less of $N_{ij}$	Cr = 0.5 (3) + Cu) + 3.2 Mo ≥ 16		
	,		following equations (5) through (8),	
2.1	,			•
1		090 1 -14- 02 900 0		
	·	14.0≤Cr+Mo+1.5 Si ≤ 15	.0 (5)	

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2	.0≤ Ni+ 30 (C + N) + 0.5 (Mn + Cu) ≤	3.0	(6)
•	ariangines ha	una asia i ermela monstri rom f	. }*
	Cr+0.5 (Ni+Cu)+33 Mo ≥ 16.0	· ·	(7)
	01+0.0 (141+0u)+00 1410 2 10.0	न्त्रमः प्रतितार गणनवस्यक्तारकः ।	(1)
		th DE to the formals or less of C	
	0.010≤ C+N ≤ 0.02	1.0% by mass or less of St	(8)
		ार्थ के बंधने के अस्क्रम पूर्व भेग हैं।	<b>\</b> -,
	0 46 48 1000 000 1000 1000	0.04% by masc or less of F	
wherein, the contents of C, N, Si, Mr			
and wherein said structure incl		-C 191, by mass or less of Ai	
•	tensite,O -o mam_rd 4070 - adti- consisting of ferrite;m: vd 400,0 nadt a		
-	f said high-strength stainless steel s	•	osion
resistance and punching workability	-	uest is assigned to be executed it pour	001011
resistance and punching workability		namedat of dame utas os	
5. The high-strength stainless steel she			
		•	
6. The high-strength stainless steel she			
strength stainless steel sheet for rim r	naterial to be used for bicycles, unicyc	cles, carts using spoke wheels, tricy	cles
and wheelchairs.	- 14N=30, 74A>=0,5(Mn=CG)<		
		to E whomain asid stant short is a	, hat
7. The high-strength stainless steel sho	et according to any one of Claims 1	to 5, wherein said steel sheet is a	1 11Qt
rolled steel sheet.	OF CERMACHAGE Mobiles		
	set according to any one of Claims 1	to 6. wherein said steel sheet is a	cold.
B. The high-strength stainless steel she rolled steel sheet.		to of Athoront and Steel Slicet is a	JU10
Li	120 0 3 M = 0 1 800 0	•	
anara cooling rate of 1.ºC/s or fasten said	·	eard the raivainder essentials	
a composition including: અંગે composition further comprises તો મેક્ટર	and the same of th	The second of th	(4
אים כמודומים משתחים משתחים פאר ופינים O.02% by mass or less of C			
1.0% by mass or less of Si,	•		
2.0% by mass or less of Mn	, than 2 0% by mass of Molans	6 18- Number on men outles	
0.04% by mass or less of P,		Prince state or more buildes	
0.01% by mass or less of S		which comes in property of property with the west of the second	
enthul notified0:1:% by:mass ordess of Al	1	•	
	·	The high-stein (in stainless steel a	: 2
11% by mass or more but le	·	The high-strain stainless step! a compreses	
•	heat according to any one of claims,		
•	smista to end you of publicoes teeds ess than 17% by mass of Cr, ess than 3.0% by mass of Ni, and		
0.5% by mass or more but I 0.02% by mass or less of N	smista to end who of publicoos teeds ess than 17% by mass of Cr, ess than 3.0% by mass of Ni, and	23 <b>2</b> 047 100 24: 11: 207609- 6v 11: 24609-0	;
0.5% by mass or more but I 0.02% by mass or less of N	smista to end you of publicoes teeds ess than 17% by mass of Cr, ess than 3.0% by mass of Ni, and	23 <b>2</b> 047 100 24: 11: 207609- 6v 11: 24609-0	;
0.5% by mass or more but I 0.02% by mass or less of N	ess than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do not be also do no	cos narses A OAJES, to 2 OAROS, even ses The high-errendth eternos, eteche	·
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0.5% by mass or more but I 0.02% by mass or less of N	smisto to end when of publicoods teeds ss than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do not be stopped to the constant of the c	Cos harses  0 00,04% to 0 0050% over section high-scrength stannes, steeps  0 5% by rises or more but less  0 0005% to 0 0050% by mass  with the range of Circle Crians	(1)
0.5% by mass or more but I 0.02% by mass or less of N	ses than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do not see than 3.0% by mass of Ni, and do not see than 3.0% by mass of Ni, and do not see that of the constant	cos recess  n causes to n cases our second high-screads starmes, store second of the high-screads of anore but less to 0 0005% by mass with the range of C A Or are noted by mass or case of A Or are noted by mass or case of A Or are noted by mass or case of A Or are of 0 10% by mass or case of A Or are	(1)
0.5% by mass or more but I 0.02% by mass or less of N	ses than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do	contains to a considerable of the second of the high-small relations. Since $0.5\%$ , by riess or more but lead $0.5\%$ , by riess of $0.80\%$ , by mass of $0.80\%$ , by mass or less of $0.50\%$ , by mass or less of $0.50\%$ , by mass or less of $0.50\%$ , by mass or riess of $0.50\%$ , by mass or riess of $0.50\%$ , by mass or riess of $0.50\%$ , by mass or riese but less to the but less	(1) (2)
0.5% by mass or more but I 0.02% by mass or less of N so as to satisfy the following Exp	amisto to end vine of pribropos feeds is than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do not be seed to the constant of the const	Contracts  0.00,05% to 0.0050% over and The high-scrength stander. Sheets  0.5% by riess of anore but lead the range of $C$ At $C$ and with the range of $C$ At $C$ and $C$ 0.020% by mass or more but lead 0.020% by more but lead 0.020% by mass or more but lead 0.020% by more but lead 0	(1) (2)
0.5% by mass or more but I 0.02% by mass or less of N so as to satisfy the following Exp	ses than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do	Contracts  0.00,05% to 0.0050% over and The high-scrength stander. Sheets  0.5% by riess of anore but lead the range of $C$ At $C$ and with the range of $C$ At $C$ and $C$ 0.020% by mass or more but lead 0.020% by more but lead 0.020% by mass or more but lead 0.020% by more but lead 0	· (1) (2)
0.5% by mass or more but I 0.02% by mass or less of N so as to satisfy the following Exp	amisto to end vine of pribropos feeds is than 17% by mass of Cr, ess than 3.0% by mass of Ni, and do not be seed to the constant of the const	Contracts  0.00,05% to 0.0050% over and The high-scrength stander. Sheets  0.5% by riess of anore but lead the range of $C$ At $C$ and with the range of $C$ At $C$ and $C$ 0.020% by mass or more but lead 0.020% by more but lead 0.020% by mass or more but lead 0.020% by more but lead 0	;

wherein, the contents of C, N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass.

10. The manufacturing method for a high-strength stainless steel sheet according to Claim 9, wherein said composition further comprises at least one of:

0.1% by mass or more but less than 2.0% by mass of Mo, and 0.1% by mass or more but less than 2.0% by mass of Cu.

11. The manufacturing method for a high-strength stainless steel sheet according to any one of Claims 9 or 10, wherein said composition further comprises:

0.0005% to 0.0050% by mass of B.

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*30* ·

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*50* 

12. The manufacturing method for a high-strength stainless steel sheet according to Claim 9, wherein said composition further comprises:

0.5% by mass or more but less than 2.0% by mass of Mo and 0.0005% to 0.0050% by mass of B, with the range of C, Al, Cr, and N, being further restricted to 0.020% by mass or less of C, 0.10% by mass or less of Al, 11.0% by mass or less of Al, 11.0% by mass or less of N, 13.438

and with said Expressions (1) through (4) being replaced by the following Expressions (5) through (6)

 $14.0 \le Cr \cdot Mo \cdot 1.5 \cdot Si \le 15.0 \cdot  

Cr + 0.5 Nl + 3.3 Mo ≥ 16.0

0.010≤C+N≤0.02

(8)

Mo, Ni and Cu are in % by mass,

wherein, the contents of C, N, Si, Mn, Cr, Mo, Ni and Cu are in % by mass,

wherein said material is subjected to finishing heat treatment of being heated to a temperature within a range of 900 to 1200°C and then cooled at a cooling rate of 5°C/s or faster,

and wherein the composition of said high-strength stainless steel sheet is designed for excellent corrosion resistance and punching workability of weld zones:

- 13. The manufacturing method for a high-strength stainless steel sheet according to Claim 12, said composition containing less than 0.04% by mass of Cu.
  - 14. The manufacturing method for a high-strength stainless steel according to any one of Claims 12 or 13, wherein said steel sheet is a high-strength stainless steel sheet for rim material to be used for bicycles, unicycles, carts using spoke wheels, tricycles, and wheelchairs.
  - 15. The manufacturing method for a high-strength stainless steel sheet according to any one of Claims 9-13, wherein said steel sheet is a hot-rolled steel sheet.
- 16. The manufacturing method for a high-strength stainless steel sheet according to any one of Claims 9-14, wherein said steel sheet is a cold-rolled steel sheet.

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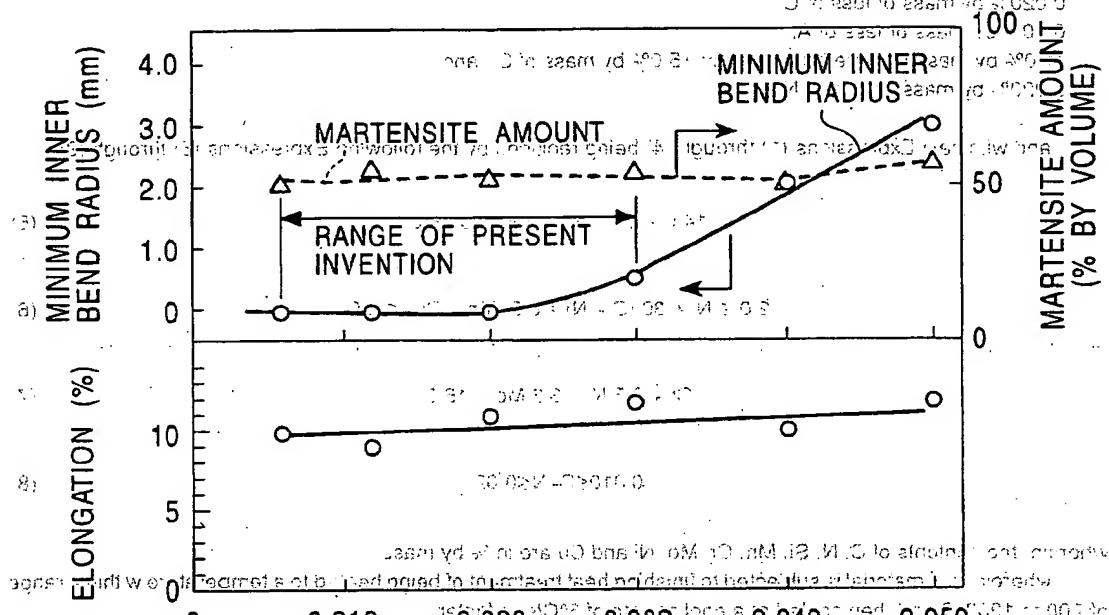
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- 13. The transfer they method at a teat interplantation, seeing according to Olem 12, said ambestion containing less then 104th by transfer of 10.
- 14. The manufacturing method to la high-scientifications agent according to any one of Claims to color wherein said steel sheel sheet is a first steel steel sheet in the content to be unadded to be properly unloveled (activishing so the wheels trevers and whoshers is
- 15. The manufacturing method to a high-cirencil staintes subjected according to any over of Clients 9.12, wherein said stad substitutes about of elections.
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FIG. 2

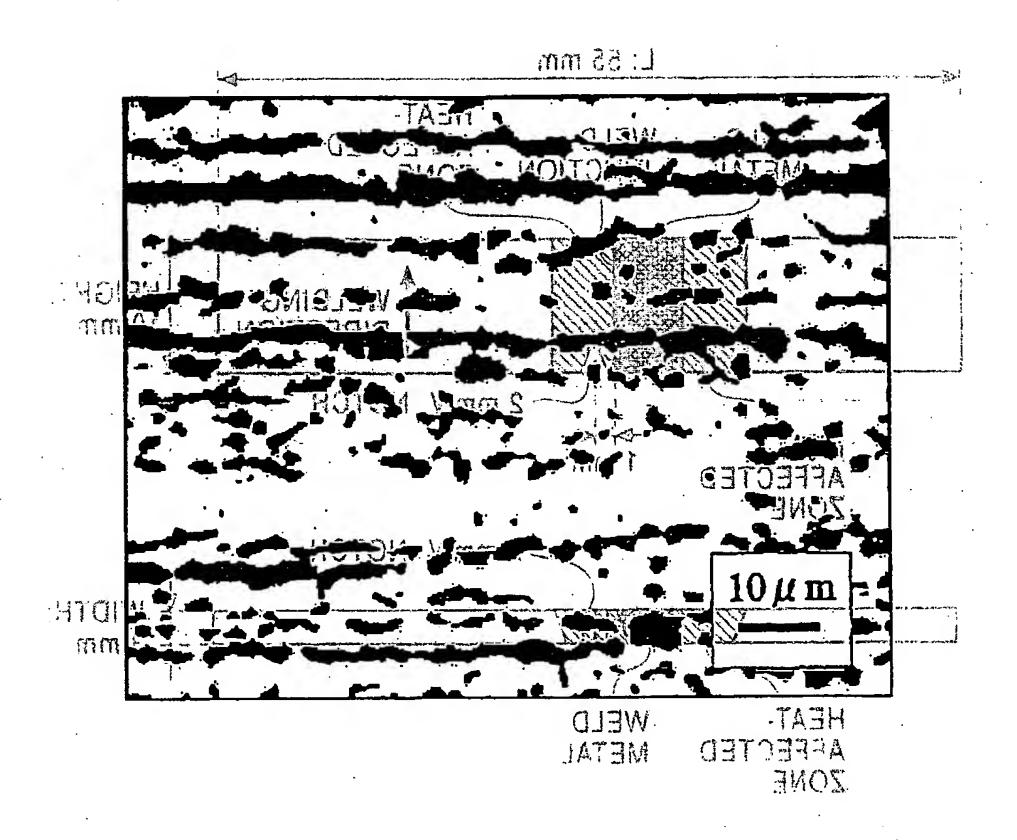
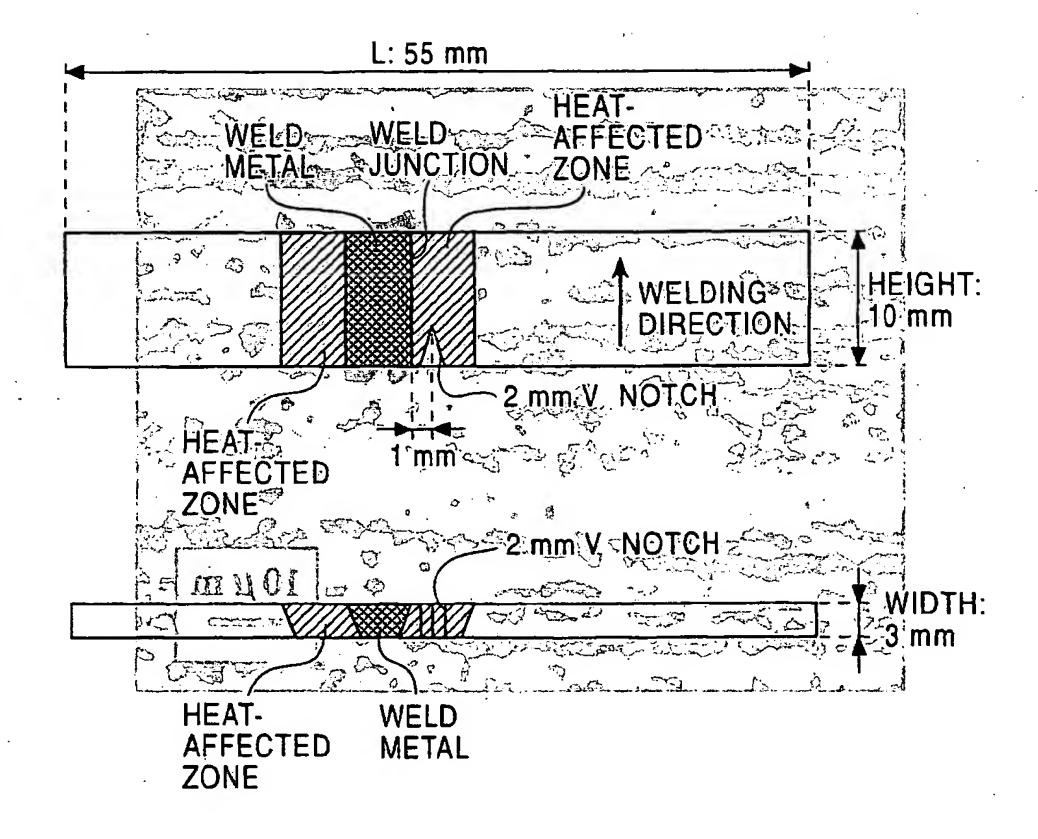


FIG. 3



## FIG. 4

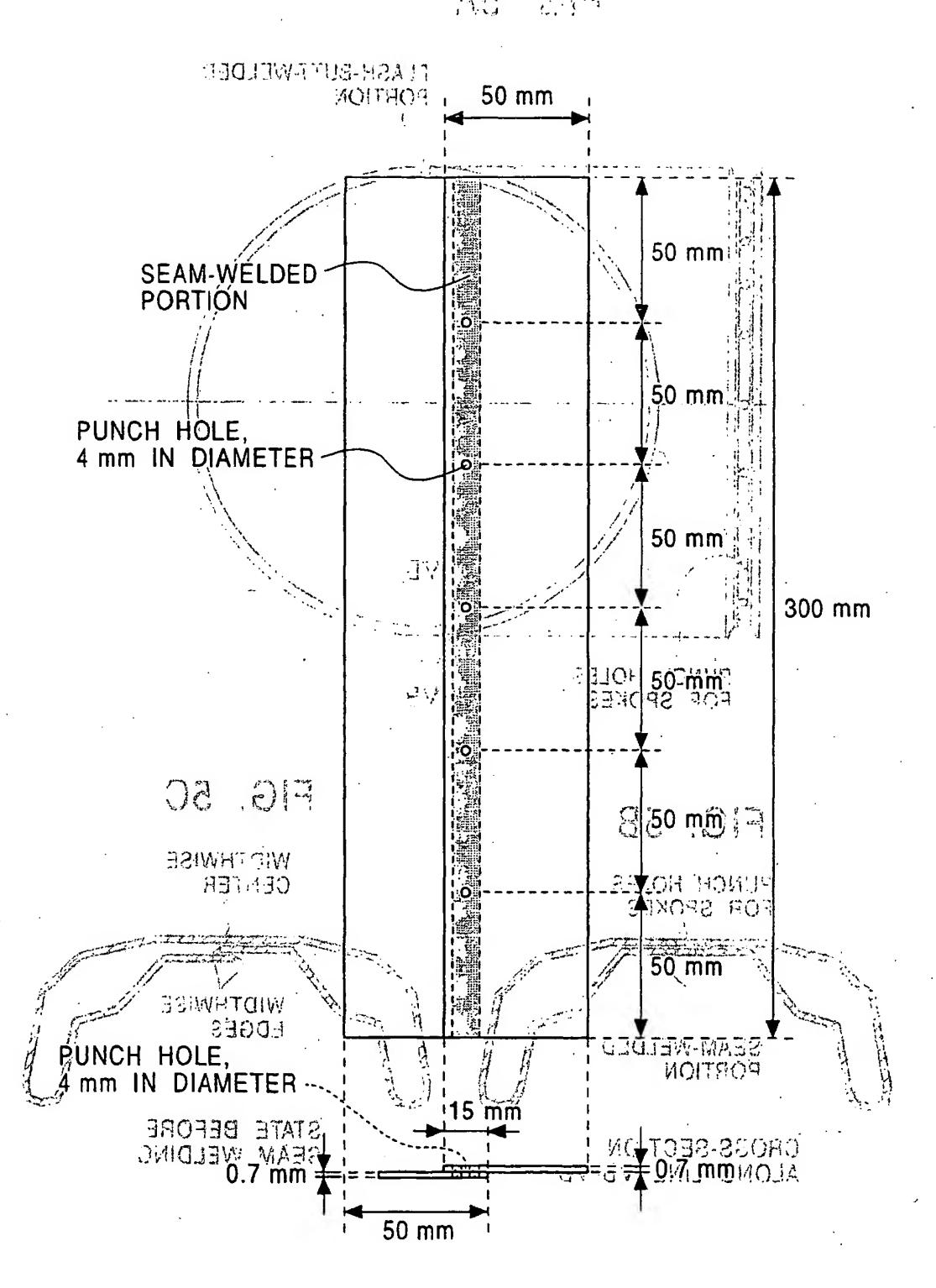
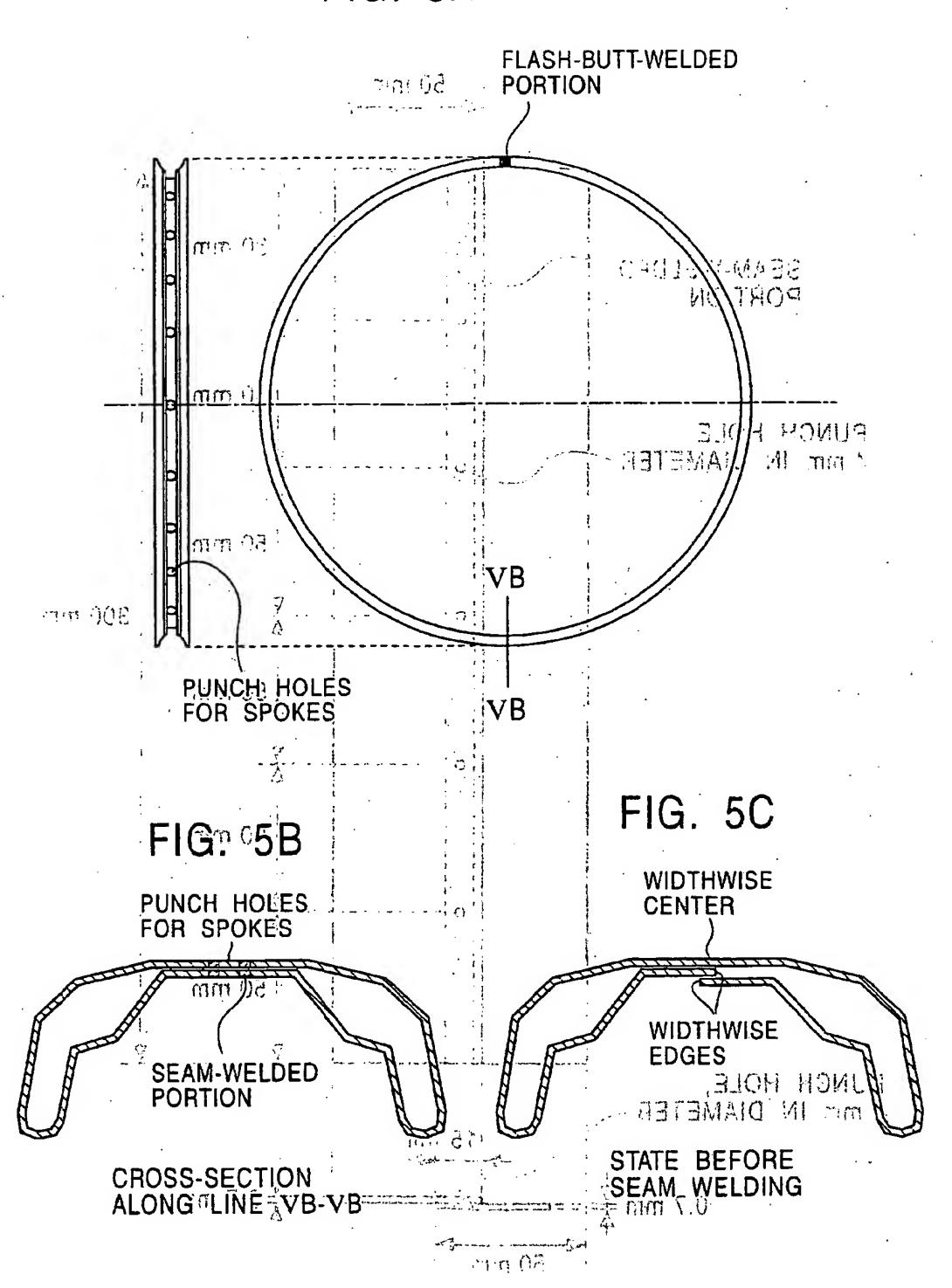


FIG. 5A



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